Revised Sampling and Analysis Plan for Additional Characterization of Porous and Non-Porous Surfaces in Lewis Hall, University of California, Berkeley

Submitted as Revised Amendment No. 2 to the Application Notice to Obtain a Risk-Based Approval to Remove and Dispose of Piping and Ancillary Equipment for the Existing Vacuum System Located in Lewis Hall, University of California, Berkeley, CA

Prepared for
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Acronyms and Abbreviations

APF	Assigned protection factor
C°	Degrees Centigrade
CFR	Code of Federal Regulations
cm	Centimeters
cm2	Square centimeters
COC	Chain-of-Custody
cyd	Cubic yard
DC	Direct current
DOT	Department of Transportation
EBMUD	East Bay Municipal Utilities District
EH&S	Office of Environment, Health, and Safety
HEPA	High efficiency particulate air
hp	Horse power
HR	Hazard ratio
ft2	Square feet
IDW	Investigation-derived waste
lpm	Liters per minute
µg/cm2	Micrograms per square centimeters
mg/kg	Milligrams per kilogram
NIOSH	National Institute for Occupational Safety and Health
NMAM	NIOSH Manual of Analytical Methods
OV	Organic vapor
oz.	Ounce
PBZ	Permissible breathing zone
PCB	Polychlorinated biphenyl
PM	Particulate matter
PEL	Permissible exposure limit
PPE	Personal protective equipment
QC	Quality control
SAP	Sampling and Analysis Plan

Acronyms and Abbreviations (cont'd)

SOP	Standard operating procedures
UC Berkeley	University of California, Berkeley
U.S. EPA	United States Environmental Protection Agency

1.0 INTRODUCTION

This revised Sampling and Analysis Plan (SAP) has been prepared by 4LEAF, Inc. (4LEAF) on behalf of the University of California, Berkeley's (UC Berkeley) Office of Environment, Health & Safety (EH&S) for submittal to the United States (U.S.) Environmental Protection Agency (EPA) Region 9 Waste Management Division Office. The SAP was originally submitted to EPA on January 29, 2010 as Addendum No. 2 to the "*Application Notice to Obtain a Risk-Based Approval to Remove and Dispose of Piping and Ancillary Equipment for the Existing Vacuum System Located in Lewis Hall, University of California, Berkeley, CA*" (Application Notice), dated July 8, 2009 and revised August 19, 2009. Figure 1 shows the location of Lewis Hall on the UC Berkeley campus.

As outlined in Condition No. 13 of EPA's October 2009 Conditional Approval Letter, UC Berkeley is required to prepare and submit a SAP for porous (e.g. concrete) and non-porous (e.g. metal pipes) surfaces associated with the former in-house vacuum system that will remain in Lewis Hall.

The following provides a summary on updates to site conditions since submittal of the original SAP:

- UC Berkeley has successfully removed all equipment associated with the former in-house vacuum system from the Mechanical Room located on the Ground Floor. The pipes contained a minimal amount of liquids (less than ½ gallon) and the liquids were drained from the piping prior to removal. Equipment removed consisted of three snubber tanks, two pressure vessels, vacuum pump VP 130, and all associated piping manifolds. All of the removed vacuum system equipment and liquids were handled and disposed of as polychlorinated biphenyl- (PCB-) remediation waste in accordance with 40 Code of Federal Regulations (CFR) §761.61(a)(5)(i). As a result, Condition No. 1 (drain all free flowing liquids, existing vacuum system) and Condition No. 2 (removal of entire existing system) have been met.

- UC Berkeley has successfully removed all sections of piping associated with the former in-house vacuum system that were located throughout the Ground, 1st, 2nd, and 3rd Floors of Lewis Hall and Condition No. 2 (removal of entire existing system) of EPA's October 2009 Conditional Approval Letter has been met. As a result, no sections of the vacuum system piping had to be abandoned-in-place. All of the removed vacuum system piping was handled and disposed of as PCB-remediation waste in accordance with 40 CFR §761.61(a)(5)(i).

  Since the entire lengths of these piping were removed, no sampling of piping abandoned in place will be required. Condition No. 3 (disposal of vacuum system pipe segments and piping components) which outlined the requirements for abandoning pipes in place, Condition No. 4 (sampling of vacuum system piping that may be abandoned in place), and Condition No. 5 (conditions for abandonment in place of vacuum system piping sections) of EPA's October 2009 Conditional Approval Letter are no longer applicable.

References to wipe samples to be collected from vacuum system piping abandoned in place have been removed from the revised SAP Table 3.

- UC Berkeley successfully removed the entire lengths of the two, 2-inch diameter pipes that ran vertically from the Mechanical Room No. 2 on the Ground Floor to the roof line located on the 3rd Floor of Lewis Hall (see Figure 2). One of the pipes was historically used as the exhaust line for the vacuum system pumps and the second pipe was originally installed and used as a vent line for the in-house vacuum system but was later converted into a discharge line for the excess steam vent relief system at an unknown date. The exhaust end of this pipe formerly tied into the 5-inch excess steam vent relief line on the roof of Lewis Hall (Figure 2). All of the removed sections of the two, 2-inch diameter piping was handled and disposed of as PCB-remediation waste in accordance with 40 CFR §761.61(a)(5)(i).

As a result, Condition No. 8 (removal of vacuum exhaust pipe) of EPA's October 2009 Conditional Approval Letter has been met. **References to wipe samples to be collected from vacuum system piping abandoned in place have been removed from the revised SAP Table 3.**

- UC Berkeley successfully completed the sampling of the northern portion of the Mechanical Room No. 2 including collecting bulk concrete samples from 15 locations; collecting surface wipe samples from the external surfaces of the electrical panel for the inactive 125-horse power (hp) motor/generator unit, external surfaces of the 125-hp motor, external surfaces of the two direct-current (DC) generators, and the metal support frame for the motor/generator unit; and collecting bulk samples of the wire sheathing of the wiring in the electrical panel. Results of this sampling were summarized in a letter to USEPA dated May 25, 2010.

- UC Berkeley successfully removed the inactive 125-hp motor / generator unit and the electrical control panel to allow installation of the new vacuum system equipment in the northern portion of the Mechanical Room No. 2. A temporary dividing partition was constructed around the northern portion of the Mechanical Room No. 2 after the new vacuum system equipment was installed to prevent any dust generated during the collection of bulk concrete samples identified in the SAP from potentially contaminating the new equipment.

- UC Berkeley performed additional sampling of the 2- and 4-inch diameter excess steam vent release piping in the Mechanical Room No. 2B (located adjacent to Mechanical Room No. 2) to evaluate if the piping could an remain in place or had to be removed and disposed off site as PCB-remediation waste in a similar manner as other vacuum system piping. The 2- and 4-inch piping ran between the Mechanical Room No. 2B on the Ground Floor and the 3rd Floor where they tied into the 5-inch diameter excess steam vent release line on the roof of Lewis Hall (see Figure 2).

  UC Berkeley also collected wipe samples from the concrete floor surfaces underneath the discharge ends of the small diameter condensate drip lines that are on the downstream

sides of the pressure relief valves for the 2-inch and 4-inch excess steam vent release lines. The small inside diameter of the drip lines (less than 1/8th of an inch) precluded collecting wipe samples from the inside surfaces of these pipes. Each surface wipe sample was collected from an area measuring 10- by 10-cm or 100 square centimeters (cm^2). Results of this sampling were summarized in a letter to USEPA dated December 22, 2010.

Based on the results of various wipe sampling performed during the last two years, UC Berkeley removed the entire sections of the 2-, 4-, and 5-inch diameter piping and associated condensate drip lines and installed new excess steam vent piping for the building (see Figure 2). As a result, Condition No. 7 (steam condensate pipeline and excess steam vent or exhaust pipeline) of EPA's October 2009 Conditional Approval Letter has been met. All of the removed sections of the drip condensate piping and the 2-, 4-, and 5-inch diameter piping was handled and disposed of as PCB-remediation waste in accordance with 40 CFR §761.61(a)(5)(i).

- UC Berkeley collected a liquid sample of the available liquid condensate in the building's steam system supply line. The liquid sample was collected to evaluate if PCBs were present in the steam supply system that originates in the campus's Central Plant. PCBs were not detected in the liquid sample and the results of the liquid condensate sample were summarized in a letter to USEPA dated December 22, 2010.

2.0 DATA QUALITY OBJECTIVES

Data quality objectives ascertain the type, quality, and quantity of data necessary to address a problem before sampling and analysis begin. EPA's October 2009 Conditional Approval Letter identified the following items in Lewis Hall that require additional characterization and investigations for potential PCB contamination:

- Collecting representative bulk concrete samples from the southern portion of the Mechanical Room No. 2 located on the Ground Floor of Lewis Hall where the in-house vacuum system equipment was removed (see Figure 3) (EPA Condition 6 of October 2009 Conditional Approval Letter). Bulk concrete characterization samples have already been collected in the northern portion of the Mechanical Room No. 2 prior to the installation of the new in-house vacuum system.

Bulk concrete samples still need to be collected in the southern portion of the Mechanical Room No. 2 where the former vacuum system equipment was located and in the adjacent Mechanical Room No. 2B where the condensate drip lines for the 2- and 4-inch diameter excess steam vent release piping were located (see Figure 4). The bulk concrete samples will be collected to determine if the concrete floor, walls, and equipment pedestals in these areas are contaminated with PCBs and if the concrete must be cleaned up or removed to achieve the proposed risk-based PCB cleanup levels. The number and locations of the bulk concrete characterization samples will be determined following guidance presented in the EPA document "*EPA Region 1 Standard Operating Procedure*

for Sampling Porous Surfaces for PCBs" [EPA Region 1 Standard Operating Procedure (SOP)], Revision 2, dated April 10, 2008 (EPA 2008a) and guidance provided in 40 CFR §761 Subpart O. The analytical laboratory's reporting limit for PCB concrete samples, assuming minimal matrix interference from the pulverized concrete media, varies between 0.0035 and 0.0053 milligrams per kilogram (mg/kg) for the seven Aroclors reported under EPA Method 8082. The samples will be of sufficient quality to evaluate the bulk concrete samples and compare to the proposed risk-based PCB cleanup levels for the various Aroclor compounds reported under EPA Method 8082.

- Performing post-confirmation sampling following any cleanup or removal of any portions of concrete floor or walls that contain PCBs at concentrations exceeding the proposed risk-based PCB cleanup levels for concrete in the southern portion of the Mechanical Room No. 2 where the former in-house vacuum system was located and in the adjacent Mechanical Room No. 2B where the condensate drip lines for the 2- and 4-inch diameter excess steam vent release piping were located. The PCB-contaminated concrete will be removed using the mechanical methods outlined in Section 9.

- Collecting wipe samples and sediment samples around the inlets of the floor drain in the southern portion of the Mechanical Room No. 2 and the floor drain in the adjacent Mechanical Room No. 2B prior to grouting the inlets of each floor drain (EPA Condition 9) (see Figures 3 and 4). Sediment samples will only be collected if sediment is present in sufficient quantity to submit to an analytical laboratory for PCB analysis. UC Berkeley has reviewed available building drawings and has confirmed that these floor drains extend beneath the building's concrete floor and connect to the building's sanitary sewer line. As a result, almost the entire segments of the two floor drain piping are inaccessible to sampling and the lines cannot be decontaminated or removed since they cannot be isolated and are connected to other building floor drains and sanitary lines. Figure 5 provides a schematic of the sanitary sewer piping beneath the Ground Floor along the southern portion of Lewis Hall.

  UC Berkeley submitted a work plan to East Bay Municipal Utilities District (EBMUD) on March 10, 2011 to abandon the two floor drains in place. The inlets to the floor drains will be filled with cement grout to prevent any potential future releases of liquids into the floor drain. The floor drain inlet in the southern portion of the Mechanical Room No. 2 has been temporarily closed off using a plumber's plug and has remained out of service since the initial time of release in November 2008 and the floor drain inlet in the adjacent Mechanical Room No. 2B was temporarily closed off using a plumber's plug in November 2010. In a letter dated March 25, 2011, EBMUD agreed with UC Berkeley's proposed plan to seal off the drain inlets to prevent any further potential contaminants from entering the sanitary sewer at these two locations. Copies of UC Berkeley's work plan submitted to EBMUD and EBMUD's letter are provided in Appendices A and B, respectively. Figure 6 shows a typical schematic of floor drains on the Ground Floor of Lewis Hall.

- Collecting samples of oil that may be contained in the compressor, CA-8, located in the Mechanical Room (EPA Condition 10) (see Figure 4). The compressor oil samples will

be submitted for analysis of PCBs and will be reviewed to determine if the compressor must be handled, removed, and disposed off site as PCB-remediation waste in accordance with 40 CFR §761.61(a)(5)(i).

- Collecting wipe samples from the surfaces of a select number of laboratory bench tops and laboratory fume hoods on the Ground Floor and Floors 1, 2, and 3 of Lewis Hall. As defined in 40 CFR §761.3, a non-porous surface is considered "PCB-contaminated" if it contains PCB surface concentration greater than 10 micrograms per 100 square centimeters ($\mu g/cm^2$) but less than 100 $\mu g/100\ cm^2$ as measured by a standard wipe test defined in 40 CFR §761.123. As a result, the detection limits for the wipe samples collected from the laboratory bench tops should not exceed 5 $\mu g/100\ cm^2$, or half of the regulatory criteria, in order to be of sufficient quality to evaluate the sample results for disposal options. The standard analytical laboratory reporting limit for PCB wipe samples by EPA Method 8082 is 2.5 $\mu g/100\ cm^2$.
- Condition 10 of EPA's Conditional Approval Letter requests that UC Berkeley collect standard wipe samples from the interior surfaces of the natural gas pipeline in the Mechanical Room No. 2, if feasible, to determine if PCBs are present in this pipeline. UC Berkeley has confirmed that there is not a natural gas pipeline present in the Mechanical Room No. 2. Although Lewis Hall does contain piping that delivers natural gas to various laboratories in the building, the natural gas pipelines are not connected in any way with the in-house vacuum system. Therefore, UC Berkeley will not be collecting wipe samples from the inside surfaces of the natural gas pipes that are located in Lewis Hall.

3.0 SAMPLING RATIONALE

This section describes the rationale for collecting the samples proposed in this SAP. The following sections provide a detailed description of the additional sampling and characterization that will be performed as required under EPA's Conditional Approval Letter.

All bulk concrete sampling will be performed in accordance with guidance provided in the U.S. EPA Region 1 SOP and guidance provided in 40 CFR §761.61, Subpart O.

Wipe samples on exterior surfaces will be collected in accordance with the guidance provided in 40 CFR §761.123, Subpart G and the EPA guidance document "*Wipe Sampling and Double Wash/Rinse Cleanup as Recommended by the Environmental Protection Agency PCB Spill Cleanup Policy*" (Wipe Sampling Policy), dated June 23, 1997 and revised and clarified on April 18, 1991 (EPA 1991).

An alternative sampling approach as outlined in Section 4.3 will be utilized for the collection of wipe samples from the inside surfaces of the small diameter floor drain inlets (i.e. less than 4 inch diameter) since there is no standard protocol in the 40 CFR §761.61 regulations for collection of these type of samples.

3.1 Bulk Concrete Characterization Sampling

As outlined in Condition No. 6 of EPA's Conditional Approval Letter (EPA 2009), UC Berkeley is required to collect bulk concrete samples from concrete floors and walls of the Mechanical Room No. 2 where the vacuum system equipment and piping were located. Numerous wipe samples have been collected from the concrete floors, concrete equipment pedestals, and concrete wall surfaces throughout the Mechanical Room No. 2. The results of these wipe samples are presented in the UC Berkeley's "*Application Notice to Obtain a Risk-Based Approval to Remove and Dispose of Piping and Ancillary Equipment for the Existing Vacuum System Located in Lewis Hall*" [UC Berkeley Application Notice], dated July 8, 2009 and revised August 19, 2009 (UC Berkeley 2009). In summary, the PCB concentrations in these wipe samples ranged from non-detect (less than the laboratory reporting limit of 2.5 $\mu g/cm^2$) to a maximum concentration of 59.1 $\mu g/cm^2$.

Bulk concrete samples have also been collected from 15 locations in the northern portion of the Mechanical Room in accordance with the "*Sampling and Decontamination Plan for the Portion of the Mechanical Room where the New In-House Vacuum System will be Installed*", (Sampling and Decontamination Plan) dated January 15, 2010 (4LEAF, 2010a and 2010b). The results of the bulk concrete samples collected from the northern portion of the Mechanical Room are presented in a letter to USEPA dated May 25, 2010.

Under this revised SAP, bulk concrete characterization samples will be collected from the following areas on the Ground Floor of Lewis Hall:

- The concrete surfaces of the floors, walls, and equipment pedestals in the southern portion of the Mechanical Room No. 2 where the former vacuum system equipment was located.
- The concrete surfaces of the floors and walls in the Mechanical Room No. 2B where the condensate drip lines for the recently removed 2- and 4-in. diameter excess steam vent release lines were located.

The number and locations of proposed characterization samples in this revised SAP were developed using guidance provided in the U.S. EPA Region 1 SOP and is intended to determine if PCBs have migrated into the concrete matrix of the floor and walls from past spills or releases of materials. As identified in the EPA Region 1 SOP, the sample design must meet the minimum sampling requirements:

- Suspected stained area(s) should be sampled.
- At each separate location, collect at least three samples of each type of porous surface, regardless of the amount of each type of porous surface present.
- In areas where PCB equipment was used or where PCBs were stored, samples should be collected at a frequency of one sample per 100 square feet (ft^2).

As outlined in Condition C1 of EPA's March 1, 2010 Conditional Approval Letter for the Sampling and Decontamination Plan, USEPA required an industrial risk-based PCB cleanup level for concrete not to exceed a maximum concentration of 10 mg/kg total PCBs in any sample at a maximum uniform depth for each sample of no more than 1 inch where the average concentration of all samples taken is less than or equal to the risk-based concentration of 7.4 mg/kg total PCBs (4LEAF, 2010b).

During the initial round of characterization sampling, bulk concrete samples will be collected at depths of ¼ inch and ½ inch at each location for walls, floor, and equipment pedestals. An average PCB concentration will be calculated for each depth sampled (¼ inch and ½ inch) by summing the concentrations of the seven Aroclor compounds reported under EPA Method 8082 (Aroclor-1016, -1221, -1232, -1242, -1248, -1254, and -1260) and dividing the sum by the total number of results for all Aroclors for that particular depth. If the calculated average concentrations for the ¼ inch and ½ inch depths are less than or equal to 7.4 mg/kg and the maximum individual PCB concentration for all samples is less than or equal to 10 mg/kg, then the concrete will be considered sufficiently clean (4LEAF, 2010b).

If necessary, additional characterization of bulk concrete samples will be collected at depths of 1 inch and 1 ¼ inches at the locations where the PCB concentrations exceeded the proposed risk-based PCB cleanup levels for concrete in the initial characterization samples collected at depths of ½ inch. The following sections identify the locations where bulk concrete samples will be collected.

3.1.1 Visibly-Stained Concrete Surfaces

Bulk concrete samples will be collected from concrete floor, wall, and equipment pedestal surfaces that have visibly moderate or large-sized stained surfaces in southern the portion of the Mechanical Room No. 2. The concrete floor surface is currently covered with absorbent pads that were installed following the decontamination and cleaning activities performed in the Mechanical Room No. 2 in January and February 2009. UC Berkeley has identified nine locations where staining is evident along the concrete floor or equipment pedestals and one location where staining is evident along the concrete wall surface (see Figure 3). These samples will be collected using the procedures outlined in Section 4.

Bulk concrete samples will be collected from concrete floor and wall surfaces that have visibly stained surfaces in the Mechanical Room No. 2B where the condensate drip lines for the former 2- and 4-inch diameter steam vent release lines were located. UC Berkeley has identified staining along the concrete floor and wall surfaces immediately below the locations of the recently removed condensate drip lines for the 2- and 4-inch diameter excess steam vent release lines (see Figure 4). These samples will be collected using the procedures outlined in Section 4.

3.1.2 Hard Porous Surfaces

In addition to collecting samples from locations where staining has been identified, bulk concrete samples will be collected from the following randomly-selected locations:

- 11 randomly-selected locations on the concrete floor and from five (5) randomly-selected selected locations from the adjoining concrete walls in the southern portion of the Mechanical Room No. 2 where the former vacuum system equipment has been removed (see Figure 3).

- 10 randomly-selected locations on the concrete floor and from five (5) randomly-selected locations from the adjoining concrete walls in the adjacent Mechanical Room No. 2B where the condensate drip lines for the excess steam vent release lines were located (see Figure 4).

The randomly-selected bulk samples will be collected at a frequency of one sample per 25 ft^2 of concrete floor area and one sample per 25 ft^2 of surface area of each adjacent concrete wall. Samples that are collected from the concrete wall surfaces will be collected at a point between the bottom of the wall and a maximum height of 6 feet (and defined in 40 CFR §761.123 as a high-contact residential/commercial surface).

The random sample locations were determined by superimposing multiple 5-ft by 5-ft grids over the two rooms and the samples will be collected using the procedures outlined in the following sections.

UC Berkeley also performed a statistical evaluation of the number of proposed bulk concrete samples to determine if the number of proposed samples is statistically valid for comparing the bulk concrete sample results to UC Berkeley's proposed, and approved by USEPA, risk-based cleanup level of 7.4 mg/kg. The number of samples required to compare the bulk concrete sample results to the revised risk-based cleanup levels is dependent on the type of comparison that will be performed to make that determination. Sample size formulas are unique to the statistical test used to make the comparison. Because the mean will be compared to the approved risk-based cleanup level of 7.4 mg/kg for total PCBs, the one-sample t-test and its associated sample size formula are appropriate for the bulk concrete analysis. The sample size formula is:

$$n = \frac{\sigma^2 \left(z_{1-\beta} + z_{1-\alpha}\right)^2}{\Delta^2} + (0.5) z_{1-\alpha}^2 \,{}_1$$

[1] The sample size can only be statistically defensible if a statistical test is used. The comparisons proposed by USEPA Region 9 staff (maximum comparison and simple comparison of arithmetic mean to threshold) are not statistical tests; therefore, the one-sample t-test is provided.

where,

n = number of samples required
σ = estimated standard deviation
z = pth percentile of the standard normal distribution
Δ = minimum detectable difference
α = chance of erroneously rejecting the null hypothesis
β = chance of failing to reject the null hypothesis when it is true.

Error rates and other parameters need to be estimated to compute the appropriate sample size formula. This also necessitates defining null and alternative hypotheses for the t-test. The null hypothesis for the test is the mean concentration of total PCBs in the concrete is greater than or equal to 7.4 mg/kg. The alternative hypothesis is that the mean concentration of total PCBs in the concrete is less than 7.4 mg/kg. Error rates (α, β, and Δ) need to be defined and the standard deviation must be estimated to determine the appropriate sample size. Values of $\alpha = 0.05$, $\beta = 0.10$, and $\Delta = 0.25$ are determined to be acceptably accurate. It is also estimated that the standard deviation will be no more than 45% of the 7.4 mg/kg threshold. These values can be applied to the sample size formula to determine the appropriate number of samples.

$$n = \frac{0.45^2(1.282 + 1.645)^2}{0.25^2} + (0.5)1.645^2 = 29.1$$

The sample size formula indicates that the proposed number 92 bulk concrete samples in the two mechanical rooms will be sufficient for determining if the mean concentration of total PCBs in the concrete floor and adjacent walls is less than 7.4 mg/kg. These parameter estimates will be verified once data are collected.

3.3 Sampling and Abandonment of Floor Drain Inlets

As outlined in Condition No. 9 of EPA's Conditional Approval Letter (EPA 2009) and based on subsequent conversations and correspondence with EPA Region 9 and EBMUD staff, UC Berkeley will collect wipe samples from the inside surfaces of the piping for the floor drain in the southern portion of the Mechanical Room No. 2 (see Figure 3) and the floor drain in the adjacent Mechanical Room No. 2B were the condensate drip lines for the 2- and 4-inch diameter excess steam vent release lines were located (see Figure 4). UC Berkeley has reviewed available piping diagrams for the Ground Floor of Lewis Hall and the piping is inaccessible at the locations it connects to other sanitary sewer laterals beneath the building and the main is inaccessible at the points it connects to other building floor drains, other sanitary sewer laterals, or the sanitary sewer main (see Figure 5).

UC Berkeley will also collect samples of any loose sediment (if present in sufficient quantity to submit for laboratory analysis) from the inlets around the two floor drains. The field notes will document if insufficient or no loose sediment are present around the inlets.

Following the collection of wipe samples and sediment samples (if necessary), UC Berkeley will abandon the two floor drains in place as shown in Figure 6 and described in Appendix A. The inlets to the floor drains will be filled with non-expansive grout or high density polyurethane foam to prevent any potential future releases of liquids into the floor drains. As required by Condition No. 18 (Deed notice) of EPA's October 2009 Conditional Approval Letter, UC Berkeley will file a deed notice that identifies that the two floor drains as potentially containing PCBs. The inlets to the two floor drains will be covered with an epoxy coating and a M_L mark placed on the concrete surfaces.

3.4 Wipe Sampling of Laboratory Bench Tops and Fume Hoods

As outlined in Condition No. 10 of EPA's Conditional Approval Letter (EPA 2009), UC Berkeley will collect surface wipe samples from a select number of laboratory bench tops and fume hoods to evaluate if the former in-house vacuum system leaked PCBs onto these surfaces in laboratories located on the Ground Floor, 1st Floor, 2nd Floor, and 3rd Floor of Lewis Hall. Surface wipe samples will be collected from the following rooms in Lewis Hall. It is noted that the piping associated with the original in-house vacuum system has been replaced with new piping and then new piping is not a potential continuing source of PCB releases.

- Ground Floor – Room 20
- Ground Floor – Room 12
- 1st Floor – Room 106
- 1st Floor – Room 111
- 2nd Floor – Room 210
- 2nd Floor – Room 204
- 3rd Floor – Room 306
- 3rd Floor – Room 324.

The following samples will be collected from each room listed above to evaluate if PCB contamination is present on the laboratory bench tops or fume hoods as a result of leaks or releases from the former in-house vacuum system:

- Surface wipe samples will be collected from a minimum of five locations (each location measuring 10- by 10-cm or 100 cm^2) on the outer surfaces of laboratory bench tops where the former original in-house vacuum system piping was present. The five individual wipe samples will be composited into one sample and submitted to the analytical laboratory for analysis of PCBs by EPA Method 8082.

- Surface wipe samples will be collected from a minimum of five locations (each location measuring 10- by 10-cm or 100 cm^2) on inside surfaces of laboratory fume hoods. The individual wipe samples will be composited into one sample and submitted to the analytical laboratory for analysis of PCBs by EPA Method 8082.

3.5 Oil Sample from Air Compressor in Mechanical Room

As outlined Condition No. 10 of EPA's Conditional Approval Letter (EPA 2009), UC Berkeley will collect a sample of oil in the air compressor, CA-8, located in the Mechanical Room No. 2 (Figure 3).

4.0 SAMPLING METHODS AND PROCEDURES

Sample logs, sample location figures, chain-of-custody forms, and certificates of analysis will be maintained at the site for all different sample types and areas.

4.1 Field Sampling Equipment

The following provides the list of field sampling equipment that will be utilized during the collection of bulk concrete samples and wipe samples.

4.1.1 Field Sampling Equipment – Bulk Concrete Samples

The following is the list of sampling equipment that will be utilized during the collection of bulk concrete samples in the southern portion of the Mechanical Room No. 2 and the adjacent Mechanical Room No. 2B where the condensate drip lines for the 2- and 4-inch diameter excess steam vent release lines were located (EPA 2008):

- Rotary-impact hammer variable-speed drill.
- 1-inch or other suitable diameter carbide-tip drill bits.
- Steel chisel or sharp cutting knife and hammer.
- Brushes and cloths for cleaning area.
- Stainless-steel scoopulas.
- Clean, aluminum pans to collect the powdered concrete wall samples.
- Clean, laboratory-supplied glass container [2 ounce (oz.)] with Teflon-lined lid.
- Decontamination supplies (hexane, two small buckets, scrub brush, phosphate-free detergent, deionized water, spray bottle containing hexane, and paper towels.
- Dedicated vacuum cleaner with a disposable filter or a vacuum pump with a dust filter.
- Sample labels, custody seals, and Chain-of-Custody (COC) forms.

- Coolers for storing samples.
- Personal Protective Equipment (PPE) – Tyvek coveralls with elastic wrists and pant legs, Tyvek shoe covers, disposable nitrile gloves, steel-toed boots, and disposable ear plugs.
- Air-purifying full-face respirators with appropriate cartridges. The full-face respirator will provide the necessary eye protection.
- Plastic garbage bags for disposal of PPE and other solid waste.
- First-aid kit.

4.1.2 Field Sampling Equipment – Wipe Samples

The following is the list of sampling equipment that will be utilized during collection of wipe samples that will be collected from the inside surfaces of the two floor drain inlets and the flat exterior surfaces of laboratory bench tops and fume hoods (EPA 2008):

- Ball-point pen (indelible ink) and sharpie pen.
- PCB wipe-sampling kit (manufactured by Dexsil Corporation). The kits include:
  - disposable wipe templates measuring 100 cm^2 are (supplied in square, rectangular, and round configurations for various surfaces).
  - disposable forceps,
  - storage vials with Teflon-lined lids. Each vial contains surgical gauze wipe pads,
  - individually sealed ampules of chromatographic-grade hexane are provided for each gauze pad, and
  - safety goggles.
- Blue masking tape to mark the intended wipe sampling locations.
- Sample labels, custody seals, and COC forms.
- Coolers for storing samples.
- PPE – Tyvek coveralls with elastic wrists and pant legs, Tyvek shoe covers, disposable nitrile gloves, eye goggles, and steel-toed boots.
- Plastic garbage bags for disposal of PPE and other solid waste.
- First-aid kit.

4.2 Field Sampling Procedures – Bulk Concrete Samples

Bulk concrete samples of the concrete floors, walls, and equipment pedestals will be collected using the procedures outlined in U.S. EPA Region 1 SOP for sampling porous surfaces for PCBs (EPA 2008a). The sample identification number, sample type, sample depth, and analysis for each bulk concrete characterization sample are provided in the sample register in Table 1.

4.2.1 Concrete Floor Samples

Concrete floor surfaces will be collected by a two-person sampling team using the following procedures:

- The location immediately adjacent to each proposed sample location will be pre-marked using a strip of blue masking tape or paint. All loose debris or sediment will be removed at each sample location using a clean brush or cloth prior to sampling.

- Lock a 1-inch or another similar sized diameter carbide drill bit into the rotary-impact hammer or variable-speed drill. Apply steady, even pressure on the drill and bit to generate a finely-ground powder that can be easily collected using a clean, stainless-steel scoopula and placed in a clean, laboratory-supplied glass jar with a Teflon-lined lid. Care should be taken not to apply too much hand pressure on the drill as this will generate excessive heat and dull the drill bit prematurely.

- Samples will be collected from the depths identified in Section 3 at each location. A ¼-inch deep hole generates approximately 5 grams of powder. Multiple holes located closely adjacent to each other may be needed to fill the 2-oz. glass jar. A minimum of 25 grams of powder will be collected in order for the analytical laboratory to perform the PCB extraction and analysis by U.S. EPA Method 8082.

- Once the necessary sample volume is obtained and transferred to the 2-oz. glass jar, the excess concrete powder or other small pieces of concrete at each sample location will be collected and managed as investigation-derived waste (IDW).

- The carbide bit will be decontaminated between each depth and sample location to prevent cross contamination. Decontamination procedures are described in Section 4.6.

4.2.2 Concrete Pedestal Samples

Concrete pedestal samples will be collected in the same manner to the concrete floor samples described above.

4.2.3 Concrete Wall Samples

Concrete wall samples will be collected in a similar manner to the floor samples described above but a clean, aluminum pan will be held below the drill to collect the falling powder generated by the carbide bit. Once sufficient concrete powder has been collected, the powder will be poured directly into the laboratory-supplied 2-oz. glass jar. Excess concrete powder or small pieces of concrete will be collected and managed as IDW. A new aluminum pan will be used to collect the powder for each sample depth at each concrete wall sample location.

4.3 Field Sampling Procedures – Floor Drain Wipe Samples

Wipe samples will be collected from the inside surfaces of the inlets to the two, 3-inch diameter floor drain pipes. UC Berkeley will remove the plumber's plugs that were placed in the floor drain inlets prior to collecting the wipe samples.

The regulations in 40 CFR §761 do not list protocols for collecting wipe samples from piping that have a diameter less than 4 inch; however, 40 CFR §761.61(c) does allow respondents to apply for alternative sampling method approval for disposal or abandonment of small-diameter pipe (Weston 2001a). The following provides sampling procedures that will be used to collect wipe samples from the inside surfaces of the two, 3-inch diameter floor drain pipes. The sample identification number and analysis for the floor drain inlet wipe samples are provided in the sample register in Table 2.

A piece of blue masking tape will be placed on the outside surface of each inlet in a location adjacent where the sample will be collected. The sample number will be written on each piece of blue masking tape using a black sharpie pen. The sample numbers will be written in large enough letters to allow the information to be legible in the photographs that will be taken of each sample location.

Based on an inside diameter of 3 inches for each drain inlet, the surgical gauze must be inserted into the pipe approximately 1.6 inches (or 1 5/8 inches) so that a corresponding surface area of 100 cm^2 is wipe sampled.

The following information will be recorded in the daily field logsheets:

- Location of the pipe to be sampled.
- Description of the pipe material (e.g. cast iron, copper, PVC, etc.).
- Sample number.
- Measured inside diameter of the pipe (in inches).

- Depth the cotton gauze was inserted into the pipe and a wipe sample collected (measured to the nearest ½ of an inch).

The sampling will performed by a two-person sampling team that have advised of, or trained in, the proper methods of collecting surface wipe samples and have read and understand the contents of this revised SAP. All of the wipe samples that are collected from the inside surfaces of the two floor drain inlets will be collected by the same sample team member (referred to as the sampler as part of this discussion) in order to provide more consistency during the sample collection process. The 2nd sample team member, referred to as the '*sampling coordinator*', will be responsible for numerous support tasks including assisting the sampler as outlined below and performing written and photographic documentation during the sampling activities. The following procedure will be used to collect wipe samples at each location:

- The *sampling coordinator* will record the location of the pipe to be sampled, the description of the pipe material to be sampled (e.g. cast iron, copper, PVC, etc.), and the sample number in the daily field logsheet.

- With gloved hands (clean disposable gloves will be donned by the *sampler* at each sample location), the *sampler* will use a ruler to measure the inside diameter. The *sampler* will make sure that the ruler does not touch the exposed end of the pipe that will be sampled to prevent contamination of the ruler and cross contamination with other pipes that will be sampled). The *sampling coordinator* will record the inside pipe diameter measurement in the daily field logsheet.

- With gloved hands (clean disposable gloves will be donned at each sample location), the *sampling coordinator* will remove the cap from the sample vial and apply the hexane solvent to the gauze immediately prior to sampling.

- The *sampling coordinator* will use clean forceps to remove the moistened gauze from the sampling vial and hand the forceps and gauze to the *sampler*.

- Using a clean, gloved hand, the *sampler* will immediately insert the end of the forceps with the moistened gauze and begin wiping the inside surface of the pipe using as uniform pressure as possible. If possible, the gauze will be inserted into the pipe to the equivalent depth that will produce a wipe surface area of approximately 100 cm^2 without getting the forceps stuck or loosing the gauze. The approximate depth that the wipe sample was into the pipe will be estimated by the sampler and recorded in the field logsheet by the *sampling coordinator*.

- The gauze will be allowed to air dry and then the *sampler* will fold the dry gauze (sampled side inward) and return it to the sample vial that is being held by the *sampling coordinator*. The *sampling coordinator* will then place the Teflon-lined cap back on the sample vial, fill out the sample label, and place in the sample cooler.

- The *sampling coordinator* will take a photograph of the sample location, being sure to included the piece of blue tape that has the sample number in the photograph.

4.4 Field Sampling Procedures – Surface Wipe Samples

Surface wipe samples will be collected in general accordance with the guidance provided in 40 CFR §761.123, Subpart G and the EPA Wipe Sampling Policy (EPA 1991). The sample identification number and analysis for the surface wipe samples are provided in the sample register in Table 3. Prior to sampling activities, each of the locations where the wipe samples will be collected from will be identified and marked using a piece of blue masking tape. The sample number will be written on each piece of blue masking tape using a black sharpie pen. The sample numbers will be written in large enough letters to allow the information to be legible in the photographs that will be taken of each sample location. The sample will be collected from the surface area immediately adjacent to the location marked with the blue masking tape.

The sampling will performed by a two-person sampling team that have been advised of, or trained in, the proper methods of collecting surface wipe samples and have read and understand the contents of this revised SAP. All of the surface wipe samples will be collected by the same sample team member (referred to as the *sampler* as part of this discussion) in order to provide more consistency during the sample collection process. The 2nd sample team member, referred to as the *sampling coordinator*, will be responsible for numerous support tasks including assisting the *sampler* as outlined below and performing written and photographic documentation during the sampling activities. The following procedure will be used to collect wipe samples at each location once the sample locations have been identified and marked:

- With gloved hands (clean disposable gloves will be donned by the sampler at each sample location), the *sampling coordinator* will remove the cap from the sample vial and apply the hexane solvent to the gauze immediately prior to sampling.

- The *sampling coordinator* will use clean forceps to remove the moistened gauze from the sampling vial and hand the gauze to the *sampler*.

- Using a clean, gloved hand, the *sampler* will immediately begin applying the moistened gauze to the non-porous surface using as uniform pressure as possible and wipe the area within the appropriately-shaped 100 cm^2 template that was provided with the Dexsil sampling kit and wipe completely first from left to right and then from top to bottom.

- The gauze will be allowed to air dry and then the *sampler* will fold the dry gauze (sampled side inward) and return it to the sample vial that is being held by the *sampling coordinator*. The *sampling coordinator* will then place the Teflon-lined cap back on the sample vial, fill out the sample label, and place in the sample cooler.

- The *sampling coordinator* will take a photograph of the sample location, being sure to include being sure to included the piece of blue tape that has the sample number in the photograph.

The COC form will identify what surface wipe samples will be composited together by the analytical laboratory.

4.5 Field Sampling Procedures – Compressor Oil Sample

An oil sample will be collected from the air compressor, CA-8, located in the northern portion of the Mechanical Room and submitted for analysis of PCBs. The oil sample will be collected by dipping the end of a clean glass pipette into the crankcase or other access port that contains oil. The oil retrieved in the pipette will then be transferred into a clean, Teflon-lined sample vial. A sample label will be placed on the vial indicating the sampling time, date, and sampler's initials and placed in the sample cooler. The sample identification number and analysis for the oil sample is provided in the sample register in Table 4.

4.6 Field Sampling Decontamination Procedures

Thorough decontamination and cleaning procedures will be following during the bulk concrete sampling activities to prevent contamination of the samples and cross contamination between sample locations. Before each use, the carbide bit(s) will be decontaminated by washing with a non-phosphate detergent such as Liquinox using a scrub brush. Since the concrete powder does cling to the drill bit's metal surface, care will be taken during this step, especially with the twists and curves of the drill bits. Each drill bit will then be rinsed with tap water and hexane and then placed on clean paper towels and allowed to air dry completely before reuse.

Disposable sampling equipment such as stainless-steel scoopulas and aluminum pans will not be reused between each sample location and will not require decontamination.

5.0 Sample Containers, Preservation, and Storage

All bulk concrete samples for PCB analyses must be placed directly into the 2-oz. wide-mouth glass container with a Teflon-lined cap using either the stainless-steel scoopulas or the aluminum pans. Once the required sample volume has been transferred to each 2-oz. jar, the Teflon-lined cap will be hand tightened, a completed sample label will be attached to the outside of the glass jar, and the sample jar placed in a cooler with ice and maintained at ≤ 6 degrees Centigrade (°C) until the time of extraction and analysis at the analytical laboratory.

6.0 Sample Documentation and Shipment

Sampling activities during field work require several forms of documentation to maintain sample identification, COC, and field logsheets to record general events or observations.

6.1 Field Notes

Required documentation for field notes will include the use of field logsheets and photographs.

6.1.1 Field Logsheets

Daily field logsheets will be utilized to describe the daily sampling activities performed. Information recorded on the field logsheets is intended to provide sufficient data to reconstruct events occurring during the sampling activities. General information regarding the sampling activities will be recorded and will include, at a minimum, the following:

- Date and time of arrival / departure of sampling personnel from the site.
- Personnel on site including occasional site visitors.
- Summary of daily activities, including any information presented at the daily safety meeting.
- Equipment on site.
- Descriptions of deviations from the revised SAP.
- Start of collection times for each sample location and sample identification.
- Description of any problems encountered during sampling at each location.
- Description of work performed.

Other appropriate observations may also be included as necessary.

6.1.2 Photographs

Photographs will be collected during the sampling activities including photographs of the individual sampling locations.

6.2 Labeling

A laboratory-supplied sample label will be affixed to each sample container sent to the laboratory. The sample label will be completed in indelible ink and include the following information:

- Project Name

- Project Number
- Sample Identification Number
- Analysis Required for that Sample Container
- Date of Sample Collection
- Time of Sample Collection.

6.3 Chain-of-Custody Forms and Custody Seals

The following provides a description of COC procedures that will be implemented during the sampling activities.

6.3.1 Chain-of-Custody Forms

COC procedures provide an accurate written record that traces the possession of individual samples from the time of field collection through laboratory analysis. A COC record will be used to document the samples collected and the analyses requested. An example COC form is provided as Figure 7. Field personnel will record the following information on the first page of the COC record (carbon copied onto the second page of the COC):

- Name of the person that the laboratory results should be submitted to.
- E-mail address of the person that the laboratory results should be submitted to.
- Project description.
- City/State that the samples were collected.
- Project Number.
- Name (printed) of the person(s) collecting the samples.
- Signature(s) of the person(s) collecting the samples.
- Check the appropriate box signifying whether the samples were immediately placed on ice after collection.
- Check the appropriate box signifying if the samples are being submitted on expedited turn around times.

- Check the appropriate box for how the results should be received from the laboratory (e.g. electronically or by facsimile).
- Sample identification number.
- Sample designation (grab or composite).
- Matrix type (e.g. soil/solid, groundwater, wastewater, drinking water, air, other).
- Depth each sample was collected.
- Date and time each sample was collected.
- Number and size of containers for each sample.
- Analyses required for each sample.
- Any remarks or special instructions for laboratory.
- Identify the number of the current COC and the total number of COCs that will accompany the samples in each cooler shipped to the laboratory.
- Signatures of personnel involved in custody transfer (including date and time of transfer).

Unused lines on the COC form will be crossed out using a single line and initialed and dated by the person marking up the COC. The first page of each completed COC form will be separated from the underlying carbon copy and placed in resealable plastic bags and taped to the inside of the cooler used for transporting the samples to the laboratory. The carbon copy of the COC form that accompanies each cooler will only contain information related to the sample containers that are shipped in that specific cooler. The first page of each completed COC will be retained along with other project records.

Upon receipt of a cooler, laboratory personnel will review the contents and then sign the carbon copy of each COC. Signed copies of the carbon-copy COC forms will serve as evidence of custody transfer between the field sampler and the laboratory. Laboratory personnel will contact 4LEAF's project manager regarding discrepancies in paperwork and sample preservation, and will document items of nonconformance and corrective actions in accordance with laboratory standard operating procedures (SOP).

After samples have been accepted by the laboratory, checked, and logged, they will be maintained in a manner consistent with the custody and security requirements specified in EPA SW-846 (EPA 2008b). Scanned versions of the copies of the COCs signed by the laboratory personnel will accompany the analytical results.

6.3.2 Custody Seals

Custody seals will be placed on each cooler to ensure that no tampering occurs to the samples between transport from the field to the analytical laboratory. Custody seals will consist of a laboratory-supplied security seal that is marked with the date, time, and initials of the sampler after the cooler lids are closed and prior to shipment to the laboratory. Two seals will be placed on each cooler so that they must be broken to gain access to the contents. Clear tape will be placed over the custody seals to protect them from accidental breakage.

6.4 Packaging and Shipment

Bulk concrete and wipe samples will be identified as environmental samples for the purpose of shipment. Environmental samples are defined as soil, water, or sediment that is not saturated with product material. U.S. Department of Transportation (DOT) regulations will be followed for packaging and shipment. All sample containers will be placed in a strong-outside shipping container (a steel-belted cooler). The following outlines the packaging procedures that will be followed for shipment of bulk concrete samples.

- Verify all sample container lids are tight.
- Wrap all glass sample containers in bubble wrap to prevent breakage and place and seal all sample containers in heavy duty plastic zip-lock bags.
- The bottom and sides of the cooler should be lined with bubble wrap to prevent breakage during shipment.
- Place samples in a sturdy cooler(s) lined with a double plastic bags provided by the analytical laboratory.
- Fill the plastic bag liners with crushed ice.
- Cinch the liners with the laboratory-supplied cable tie.
- Enclose the appropriate COC(s) in a zip-lock plastic bag affixed to the underside of the cooler lid.
- Place the custody seals on the front and side of each cooler and apply clear, plastic tape around the outside of each cooler to prevent accidental opening during shipment.

7.0 FIELD QUALITY CONTROL SAMPLES

Quality Control (QC) samples will include equipment blanks and field duplicates as described below. The locations and sample numbers of all field QC samples will be documented in the daily field logsheets and this information will not be shared with the analytical laboratory.

7.1 Equipment Rinsate Blanks

Equipment rinsate blanks are collected to assess the adequacy of the decontamination process for dedicated sampling equipment. Equipment rinsate blanks are a blank sample consisting of organic-free, reagent-grade water that has been poured over deconned, dedicated sampling equipment and collected in a clean, laboratory-supplied sample container. Equipment rinsate blanks are collected after completion of equipment decontamination and prior to reusing the dedicated equipment for collecting the next sample.

7.1.1 Equipment Rinsate Blanks – Bulk Concrete Samples

Equipment rinsate blanks will be collected at a frequency of one per day to confirm that dedicated sampling equipment was properly decontaminated. Equipment rinsate blanks will be collected from the carbide bit used to generate the pulverized concrete at each sample location. After the carbide bit has been decontaminated and air dried, equipment rinsate blanks will be obtained by flushing the outside of the carbide bit(s) with organic-free, reagent-grade water, or its equivalent. The equipment rinsate blank samples will be submitted for the same analyses as the bulk concrete samples. The sample numbers for the equipment rinsate blanks are indicated on the sample register presented in Table 1.

7.1.2 Equipment Rinsate Blanks – Surface Wipe Samples

Equipment rinsate blanks will not be collected for surface wipe samples since all of the equipment used is disposable and not reused between sample locations.

7.2 Field Duplicates

Field duplicates are collected to obtain precision data on the handling, shipping, storage, preparation, and analysis of the samples.

7.2.1 Field Duplicates – Bulk Concrete Samples

The bulk concrete field duplicate samples will consist of a thoroughly homogenized sample collected from one desired location that has been split between two sets of bottleware and

labeled as representing two separate sample locations. The laboratory will not be informed that the two samples are subsamples from a single sample location; therefore, these samples are referred to as "blind field duplicate samples". Field duplicate samples will be collected at a frequency of one for every 10 bulk concrete samples collected. The sample numbers for the field duplicates are indicated on the sample register presented in Table 1.

7.2.2 Field Duplicates – Wipe Samples

Field duplicate samples for surface wipe samples will consist of a second set of wipe samples collected at a specified location by double-wiping the same surface at each location with a second wipe, noting which wipe was collected first and which was collected second. The sample numbers that are used for the second set of wipe samples will be sequential to other samples so that they do not identify these samples as field duplicates to the analytical laboratory. The sample numbers for the field duplicate wipe samples are indicated on Table 3.

Field duplicate samples will not be collected for the floor drain inlet piping as the inlet surfaces can only be wiped once.

7.3 Field Blanks

Field blank samples are used to evaluate contamination or error associated with sampling methodology, preservation, handling/shipping, and laboratory procedures.

7.3.1 Field Blanks – Bulk Concrete Samples

Field blank samples are not applicable for solid samples such as soil, sediment, or pulverized concrete and will not be collected as part of the bulk concrete sampling activities.

7.3.2 Field Blanks – Surface Wipe Samples

The following field blank samples will be collected as part of the surface wipe sampling activities:

- One unopened sampling vial containing gauze will be labeled as a normal sample and submitted to the laboratory for analysis of PCBs.
- The cap of a sampling vial will be opened, moistened with hexane, and removed from the sampling vial using a clean set of forceps. The gauze will not be allowed to touch any surface but will be allowed to air dry and then be placed back into the same sampling vial, labeled as a normal sample, and submitted to the laboratory for analysis of PCBs.

- One surface wipe sample will be collected from an uncontaminated surface located outside of the Mechanical Room No. 2, labeled as a normal sample, and submitted to the laboratory for analysis of PCBs.

The sample numbers for the field blank wipe samples are indicated on Table 3.

8.0 FIELD VARIANCES

As conditions in the field may vary, it may become necessary to implement minor modifications to sampling as presented in this plan. When appropriate, the EPA's designated staff member will be notified and a verbal approval will be obtained before implementing the changes. Modifications to the approved plan will be documented in the daily field logsheets.

9.0 DECONTAMINATION OF POROUS SURFACES

UC Berkeley will compare the results of the bulk concrete samples will be installed with the proposed PCB risk-based cleanup level of 7.4 mg/kg for concrete surfaces.

If the calculated average PCB concentrations for the ¼ inch and ½ inch depths are greater than 7.4 mg/kg and the maximum individual PCB concentration for all samples is greater than 10 mg/kg, then UC Berkeley will evaluate the best approach to decontaminate and/or remove any high-contact porous concrete surface (e.g. floors and walls) that have been impacted by PCBs. As outlined in Condition No. 6 of EPA's Conditional Approval Letter (EPA 2009), EPA Region IX staff have recommended the use of abrasives as the most cost-effective procedure to cleanup concrete surfaces containing PCBs at concentrations exceeding the proposed risk-based cleanup level.

Several mechanical methods for decontamination of PCB-contaminated concrete surfaces using abrasives were evaluated including:

- Sandblasting and shot blasting
- Scarifying and scabbling
- Mass removal of concrete using a concrete saw cutter and jack hammer.

9.1 Sandblasting and Shot Blasting

Sandblasting and shot blasting are the most commonly used techniques where PCB contamination is limited to the upper 0.2 inch of a porous media such as concrete. Sandblasting involves blasting fine-grained, abrasive sand onto the PCB-contaminated surface to strip away surface coatings and remove porous material below. Shot blasting involves shooting varying

sizes of metal shot against the surface, and is more effective at bulk material removal. The shot is recovered in the process using a specially fitted vacuum system that separates the shot from PCB-contaminated residue (Weston, 2001b).

UC Berkeley will evaluate the cost effectiveness of using sandblasting and shot blasting to cleanup the concrete surfaces if any PCB contamination, as defined as concrete containing PCBs at concentrations exceeding the proposed risk-based PCB cleanup level, is limited to the upper ¼ inch of concrete. If sand blasting and shot blasting are either cost-or time-prohibited or the PCB contamination is present at depths greater than ¼ inch, then the alternative cleanup methods such as scarifying and scabbling or mass concrete removal using a jackhammer will be evaluated and utilized as appropriate.

As outlined in Condition No. 6 of EPA's Conditional Approval Letter, the spent shot or abrasives combined with the removed concrete particles (cleanup waste) shall be managed and disposed off site as PCB-remediation waste in accordance with 40 CFR §761.61(a)(5)(i) (EPA 2009). If the removal of PCB-contaminated concrete utilizing sandblasting or shot blasting techniques, the sandblast or shot blast material and concrete generated during these activities will be collected using a vacuum equipped with a high efficiency particulate air (HEPA) filter, placed and sealed in plastic bags, and placed in 20 cubic yard (cyd) roll-off bins and sent for direct landfill at Waste Management's Kettleman City Facility at 35251 Old Skyline Road in Kettleman City, CA 93239 (EPA ID Number CAT000646117).

9.2 Scarifying and Scabbling

Scarifying and scabbling are more applicable where PCBs extend deeper into the porous material (i.e., 0.4 to 2 inches penetration in concrete). Scarifiers contain a helical rotating cutting tool that is attached to a tractor or large mobile roller and used to remove a layer of concrete. Scabblers use small, high-pressure impact pistons to sequentially break up the concrete. Scabblers are generally smaller than scarifying units and have a lower concrete removal rate, but scabblers are more adaptable to different indoor environments. Both devices are able to shave off from $1/16^{th}$ to $1/8^{th}$ inch of concrete per pass (Weston, 2001).

UC Berkeley will evaluate the cost effectiveness of using scarifying and scabbling to cleanup the concrete surfaces if any PCB contamination is limited to the upper 2 inches of concrete. If scarifying and scabbling are either cost-or time-prohibited or the PCB contamination is present at depths greater than 2 inch, then the alternative cleanup method of mass concrete removal using a jackhammer will be evaluated and utilized as appropriate.

As outlined in Condition No. 6 of EPA's Conditional Approval Letter, all concrete particles (cleanup waste) removed using this method shall be disposed off site as PCB-remediation waste in accordance with 40 CFR §761.61(a)(5)(i) (EPA 2009). The concrete cleanup waste will be placed in placed and sealed in plastic bags, and placed in 20 cyd roll-off bins and sent for direct landfill at Waste Management's Kettleman City Facility at 35251 Old Skyline Road in Kettleman City, CA 93239 (EPA ID Number CAT000646117).

9.3 Mass Concrete Removal

If PCB contamination is identified in concrete at depths greater than 2 inch and the use of scabblers or scarifyers is deemed to be cost- and time-prohibited, jack hammers will be used to remove PCB-contaminated concrete to the required depths. The portion(s) of concrete that will be removed using a jack hammer will first be prepared by saw cutting the concrete to be removed in smaller-sized pieces.

As outlined in Condition No. 6 of EPA's Conditional Approval Letter, all concrete particles (cleanup waste) removed using this method shall be disposed off site as PCB-remediation waste in accordance with 40 CFR §761.61(a)(5)(i) (EPA 2009). The concrete cleanup waste will be placed in placed and sealed in plastic bags, and placed in 20 cyd roll-off bins and sent for direct landfill at Waste Management's Kettleman City Facility at 35251 Old Skyline Road in Kettleman City, CA 93239 (EPA ID Number CAT000646117).

9.4 Cleanup Confirmation Samples

Cleanup confirmation samples will be collected from those areas where cleanup or removal of concrete has been performed. The confirmation sampling will be performed in accordance with the guidance outlined in U.S. EPA Region 1 SOP and 40 CFR §761 Subpart O to determine the number of confirmation samples. The cleanup confirmation samples will be collected using the same procedures used for collection of bulk concrete samples as outlined in Section 4.2.

As outlined in the guidance presented in 40 CFR §761 Subpart O, a minimum of three samples must be collected for each type of bulk PCB remediation waste or porous surface at the cleanup site, regardless of the amount of each type of waste that is present. If the size of the area where any concrete is cleaned up or removed is less than 10-ft by 10-ft, then a minimum of three cleanup confirmation samples will collected from the area.

If the size of the area where any concrete is cleaned up or removed is greater than 100 ft^2, then the location of the cleanup confirmation samples shall be determined by overlaying a series of 5-ft by 5-ft grids over the entire area where concrete has been cleaned up or removed and marking out a series of sampling points that are spaced approximately 5 ft apart oriented to the grid axes. The sampling points shall proceed in every direction to the extent sufficient to result in a two-dimensional grid completely overlaying the area where concrete has been cleaned up or removed.

The concrete floor surface and the concrete surfaces of the adjacent walls will be evaluated separately to determine if cleanup confirmation samples are required for each surface. For example, if the sample results for the bulk concrete characterization samples collected from the concrete wall surfaces are less than the proposed risk-based PCB cleanup criteria but the sample results for the any of the bulk concrete samples collected from the concrete floor exceed the cleanup criteria, then only the concrete floor will be decontaminated and /or removed and confirmation samples only collected from the concrete floor.

The exact locations and numbers of any proposed cleanup confirmation samples will be determined after any areas with PCB contamination have been cleaned up or removed. UC Berkeley will submit a figure to EPA Region IX for review and approval of the proposed locations of the proposed cleanup confirmation samples.

10.0 INVESTIGATION-DERIVED-WASTE

All disposable waste (e.g. PPE, stainless-steel scoopulas, aluminum pans, cleaning brushes, etc.) generated during the sampling activities will be placed in plastic bags and managed as PCB-remediation waste in accordance with 40 CFR §761.61(a)(5)(v)(A). The disposable waste will be placed in placed and sealed in plastic bags, and placed in 20 cyd roll-off bins and sent for direct landfill at Waste Management's Kettleman City Facility at 35251 Old Skyline Road in Kettleman City, CA 93239 (EPA ID Number CAT000646117).

11.0 HEALTH AND SAFETY

The following outlines the health and safety procedures that will be implemented for collecting bulk concrete characterization samples, performing decontamination activities (if necessary), and collecting cleanup confirmation samples (if necessary).

11.1 Hazards Analysis

Potential chemical, physical, and general safety hazards that may be encountered during sampling and decontamination activities were evaluated as part of this Hazards Analysis.

Intrusive activities such as collecting bulk concrete samples performing cleanup or removal of PCB-contaminated concrete using the mechanical methods identified in Section 9 will generate fine particulate matter (PM) and may expose site workers to both PCB vapors and PCB-contaminated PM. As a result, respiratory and dermal protection will be necessary for site workers to prevent exposure to concrete dust and possibly PCBs affixed to the dust. Site workers will also be required to wear hearing and eye protection during all field activities.

Because dust that potentially contains affixed PCBs will be generated during the sample collection or procedure, complete routes of potential exposure to PCBs evaluated under this Hazard Analysis include: inhalation of fugitive dust, dermal (skin and eye), and inhalation of volatiles.

Some sampling will take place in active, research labs which contain a variety of hazards, such as electrical, chemical, lasers, temperature, and pressure hazards. To minimize and control these hazards, UC Berkeley will identify hazards specific to each laboratory and communicate them to

site workers prior to entry. The sampling crew members will use maximum care to prevent disturbance of experiments in progress and control all identified hazards.

11.2 Personal Protective Equipment

Level C PPE will be used to protect sampling personnel and site workers from the hazards and potential hazards they are likely to encounter during the field activities identified in this revised SAP. Level C protection specifies chemical-resistant clothing and an air-purifying respirator fitted with appropriate cartridges. The amount and type of PPE used is based on the nature of the hazard encountered or anticipated.

Dermal, respiratory, and eye protection will be utilized to protect sampling personnel during the collection of bulk concrete samples and site workers during the removal of any PCB-contaminated concrete from the southern portion of Mechanical Room No. 2 or the adjacent Mechanical Room No. 2B. The Level C protection that will be worn by field personnel will consist of the following:

- Full-face, air-purifying respirator equipped with an organic vapor (OV) cartridge in combination with an N95 dust filter. The full-face respirator will also provide the necessary eye protection.
- Tyvek coveralls with elastic wrists and covers.
- Tyvek shoe covers.
- Disposable nitrile gloves.
- Steel-toed boots.
- Disposable ear plugs.

11.3 Respiratory Protection

The following describes the technical basis and methodology used to determine the appropriate respiratory protection that will be used during collection of bulk concrete samples and cleanup and removal of PCB-contaminated concrete from the southern portion of Mechanical Room No. 2 or the adjacent Mechanical Room No. 2B. Respiratory protection will be required for sampling personnel who collect bulk concrete samples and site workers who perform any cleanup or removal of PCB-contaminated concrete at the site.

Potential PCB concentrations in air-borne dust were estimated using a simple zero ventilation model and the results of the wipe samples previously collected from concrete surfaces in the southern portion of Mechanical Room No. 2 and the adjacent Mechanical Room No. 2B. In

January and February, 2009, 4LEAF collected 46 wipe samples from the concrete floor and wall surfaces including the southern portion of Mechanical Room No. 2. PCBs, as Aroclor-1248, were detected in 19 of the 46 wipe samples that collected from concrete floor and wall surfaces in the southern portion of Mechanical Room No. 2 at a maximum concentration of 59.1 $\mu g/cm^2$.

The following assumptions were utilized in estimating air-borne dust PCB concentrations:

- No ventilation or dilution of air inside the room during the sampling or decontamination activities.
- 100 percent mixing of air inside the room during the sampling or decontamination activities throughout Mechanical Room No. 2.
- Entire concrete floor and wall surface areas contain PCBs at the maximum concentration of 59.1 $\mu g/100\ cm^2$ that was detected in one of the wipe samples collected from the concrete floor in the southern portion of Mechanical Room No. 2.
- Ceiling height is 8 ft.
- 100 percent of the concrete floor and walls surfaces inside of the southern portion of Mechanical Room No. 2 and adjacent room are simultaneously disturbed using the mechanical methods identified during the collection of bulk concrete samples or decontamination activities.

While this model is very basic, it is also very conservative. For example, although the majority of concrete surface wipe samples were non-detect (i.e. less than the laboratory's detection limit of 2.5 $\mu g/100\ cm^2$), the maximum wipe concentration of 59.1 $\mu g/100\ cm^2$ was assumed to be uniform throughout the concrete floor and wall surfaces in the Mechanical Room No. 2 and was extrapolated over the entire surface area used in the model.

4LEAF performed air monitoring during the collection of bulk concrete samples in the northern portion of Mechanical Room No. 2B that was conducted in April 2010. All PCBs were reported at concentrations less than the laboratory's reporting limits for the eight Aroclors reported under NIOSH Method 5503 (modified).

Using these assumptions and the following input parameters, the maximum PCB air-borne dust concentration is estimated at 2.4 mg/m^3 was calculated using the following equation:

Parameter:		
Mechanical Room dimensions	*Value*	*Units*
Floor surface area (SA)	64.1	m^2
Ceiling height (H)	2.4	m
Room volume (SA x H)	156.3	m^3
Mass of potential PCB contamination		
Concrete wipe concentration (C_w)	5,910	ug/m^2
Floor surface area (SA)	64.1	m^2
PCB contamination mass (C_w x SA)	378,846	ug

$$\text{Estimated PCB air concentration } \left(\frac{mg}{m^3}\right) = \frac{\text{PCB mass (ug)} \times \frac{1\,mg}{1000\,ug}}{\text{Room volume } (m^3)}$$

Estimated PCB air-borne dust concentration = 2.4 mg/m^3.

A full-face, air purifying respirator fitted with an organic vapor (OV) cartridge in combination with an N95 dust filter will be worn by site personnel performing bulk concrete sampling or site workers performing cleanup/removal of PCB-contaminated concrete. This respirator was chosen using the process outlined in the 2004 National Institute for Occupational Safety and Health (NIOSH) Respirator Selection Logic (NIOSH 2004). Applying the California permissible exposure limit (PEL) of 0.5 mg/m^3 for chlorodiphenyl (54 percent chlorine) and the estimated maximum PCB air-borne dust concentration (2.4 mg/m^3), the hazard ratio (HR) to determine the necessary respirator protection was calculated using the following equation:

$$\text{HR} = \frac{TWA}{PEL}$$

$$HR = 4.8$$

Parameter	Value	Units
Hazard Ratio = **HR**	calculated	unitless
8-hr time-weighted average concentration of PCBs in air = **TWA**	2.4	mg/m^3
California permissible exposure limit for chlorodipheynl (54% chlorine) = **PEL**	0.5	mg/m^3

The calculated HR value of 4.8 is less than the assigned protection factor (APF) of 10 listed in Table 3 in the NIOSH Respirator Selection Logic Guide (NIOSH 2004); therefore, a full-face respirator with a N95 PM filter and OV cartridge was selected and will be sufficient to protect sampling personnel and site workers.

It is expected that the majority of any PCB contamination will be adsorbed to the concrete PM, so the N95 filter will be worn on the inlet side of the OV cartridge to remove any PM from the air entering the filter. The OV cartridge will then remove any potential residual PCB contamination that would potentially desorb from the PM and pass through the filter.

All field personnel will have a medical evaluation completed by a licensed medical practitioner in accordance with 29 CFR 1910.134(e) prior to using a respirator. Only those personnel deemed medically fit to work in the prescribed full-face respirator will be allowed to perform site sampling or site cleanup activities.

Prior to performing on-site work, fit testing will be performed using the fit testing protocols outlined in Appendix A of 29 CFR 1910.134. Field personnel will use a respirator of the same make, model, style and size during fit testing as the one used in the field. Field personnel will also be trained in respirator use prior to field sampling. Training will be documented in writing and include the following:

- Reasons for wearing a respirator.
- The importance of proper use and fit.
- How to inspect, use and check the seals of the respirator.
- Respirator maintenance and cleaning.

Additionally, all dust and OV cartridges and filters used for concrete sampling will be labeled and color coded with NIOSH approved labels, and the OV cartridge manufacturer's recommended service life will be used to determine the change schedule.

11.4 Air Monitoring

Air monitoring will be performed during the collection of bulk concrete samples and during any cleanup or removal of PCB-contaminated concrete from the southern portion of Mechanical Room No. 2 or the adjacent Mechanical Room No. 2B where the former 2- and 4-inch excess steam vent release lines were located. The air monitoring will be consist of collecting personal breathing zone (PBZ) air samples to monitor and document the air-borne PCB dust concentrations within the breathing zone of workers and collecting area monitoring samples from a location in the areas where bulk concrete samples are being collected or concrete removed. The sample numbers for PBZ and area monitoring samples are provided in Table 5. The PBZ and area monitoring sampling will be performed in accordance with the NIOSH Manual of Analytical Methods (NMAM) Method 5503 (NIOSH 1994), which defines the requirements for sampling and analysis of PCBs in air. The following outlines the sampling procedure to be used in conjunction with the NMAM Method 5503 (NIOSH 1994):

- ***Sampling Trains.*** The sampling train employed by Method 5503 uses a GILAIR 3 RC air sampling pump with constant low-flow module or equivalent, a 13-mm glass filter in

a Swinnex cassette, and a 6 by 70 millimeter (mm) glass sorbent tube containing Florisil gel. For PBZ sampling, the sampling train and pump are assembled in accordance with Method 5503 and attached to the worker's Tyvek suit prior to the start of work. The exposed end of the Florisil is placed vertically in the worker's personal breathing zone, but in such a way as to not interfere with work activities. After entering the work zone and prior to executing work, the pump is turned on and the work start and completion times recorded in the daily field logsheet. For area monitoring sampling, the sampling train and pump are placed in a portion of the room away from the immediate location where work is being performed. The pump is turned on and the work start and completion times are recorded in the daily field logsheet.

- ***Calibration.*** Calibration of each sampling pump used for PBZ and area monitoring will be performed prior to sampling or cleanup and removal activities, with a representative sampling train attached to the pump during calibration. The pumps will be calibrated following the manufacturer's instructions. The required flow rate will be determined using the approximate time the pump can be operated in order to collect a total sample volume between 1 to 50 liters and must fall within the range 0.05 to 0.2 liters per minute (lpm). Workers performing pump calibration will record calibration results, date, time and location, ambient air temperature and barometric pressure at the time of calibration in the field logsheet. Calibration will be performed at the start and completion of daily sampling or cleanup and removal activities.

PBZ and area monitoring sampling will be performed following the calibration of each sampling pump. The following information will be recorded in the field logsheet prior to the start of daily field activities:

- Date, time and location of sampling.
- Name of worker wearing sampling equipment for PBZ monitoring.
- Activities worker will perform while wearing sampling equipment.
- Sample identification for both the glass filter and the Florisil tube.
- Serial number for sampling pumps.

At the completion of daily site activities, the sampling end time will be recorded in the field logsheet. Both the glass filters and sorbent tubes will be sealed as described in Method 5503, recorded on the laboratory COC form, and packed securely for delivery to the analytical laboratory. Results from PBZ sampling will be compared to estimated air concentrations to ensure the selected respiratory protection is appropriate.

12.0 REFERENCES

4LEAF, 2010a. "Sampling and Decontamination Plan for the Portion of the Mechanical Room where the New In-House Vacuum System will be Installed, Submitted as an Amendment to the Application Notice to Obtain a Risk-Based Approval to Remove and Dispose of Piping and Ancillary Equipment for the Existing Vacuum System Located in Lewis Hall, University of California, Berkeley, CA", January 15.

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EPA (Environmental Protection Agency) 1991. "Wipe Sampling and Double Wash/Rinse Cleanup as Recommended by the Environmental Protection Agency PCB Spill Cleanup Policy" (Wipe Sampling Policy), dated June 23, 1987 and revised and clarified on April 18.

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UC Berkeley 2009. "Application Notice to Obtain a Risk-Based Approval to Remove and Dispose of Piping and Ancillary Equipment for the Existing Vacuum System Located in Lewis Hall", dated July 8, 2009 and revised August 19, 2009.

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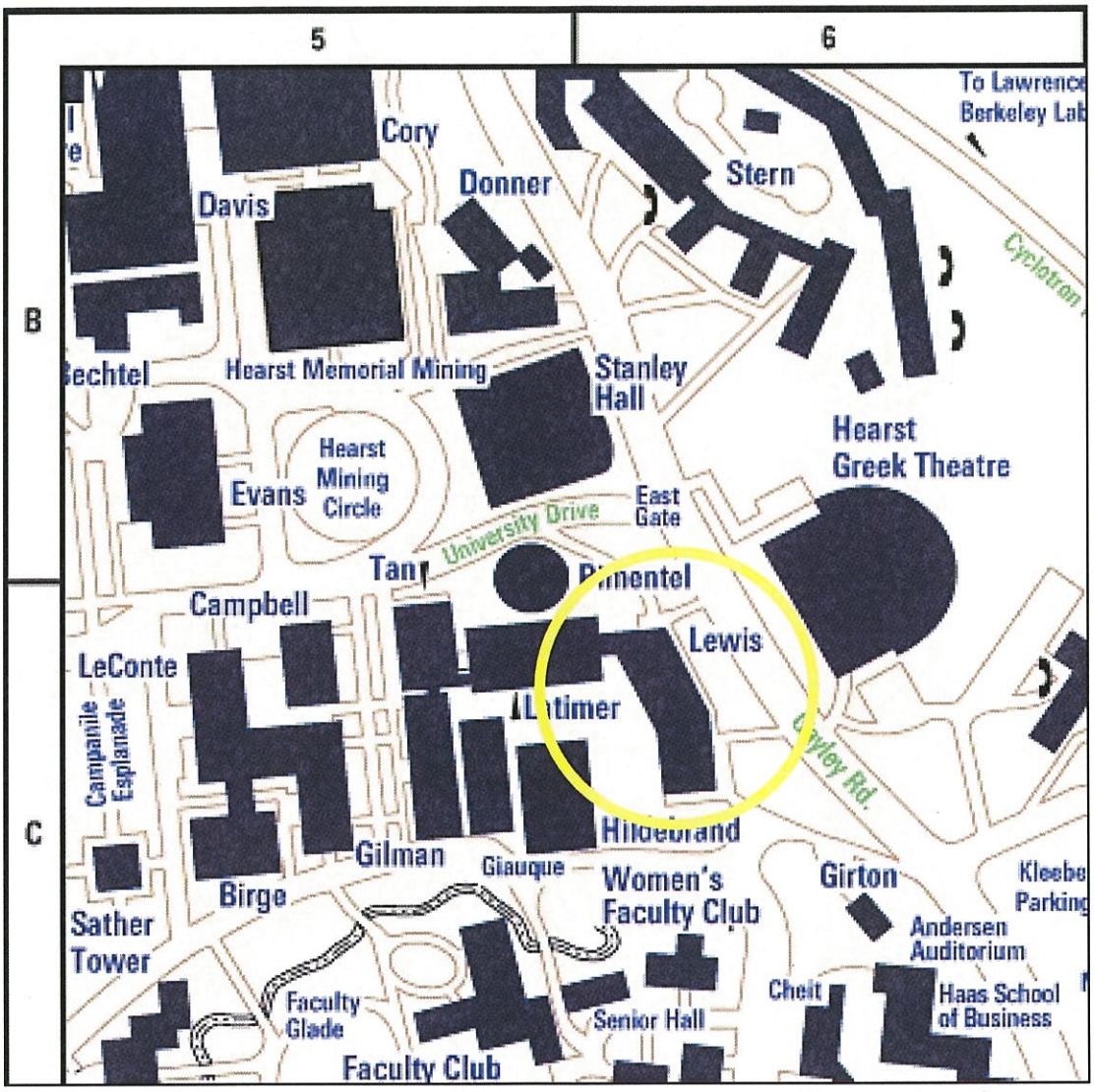
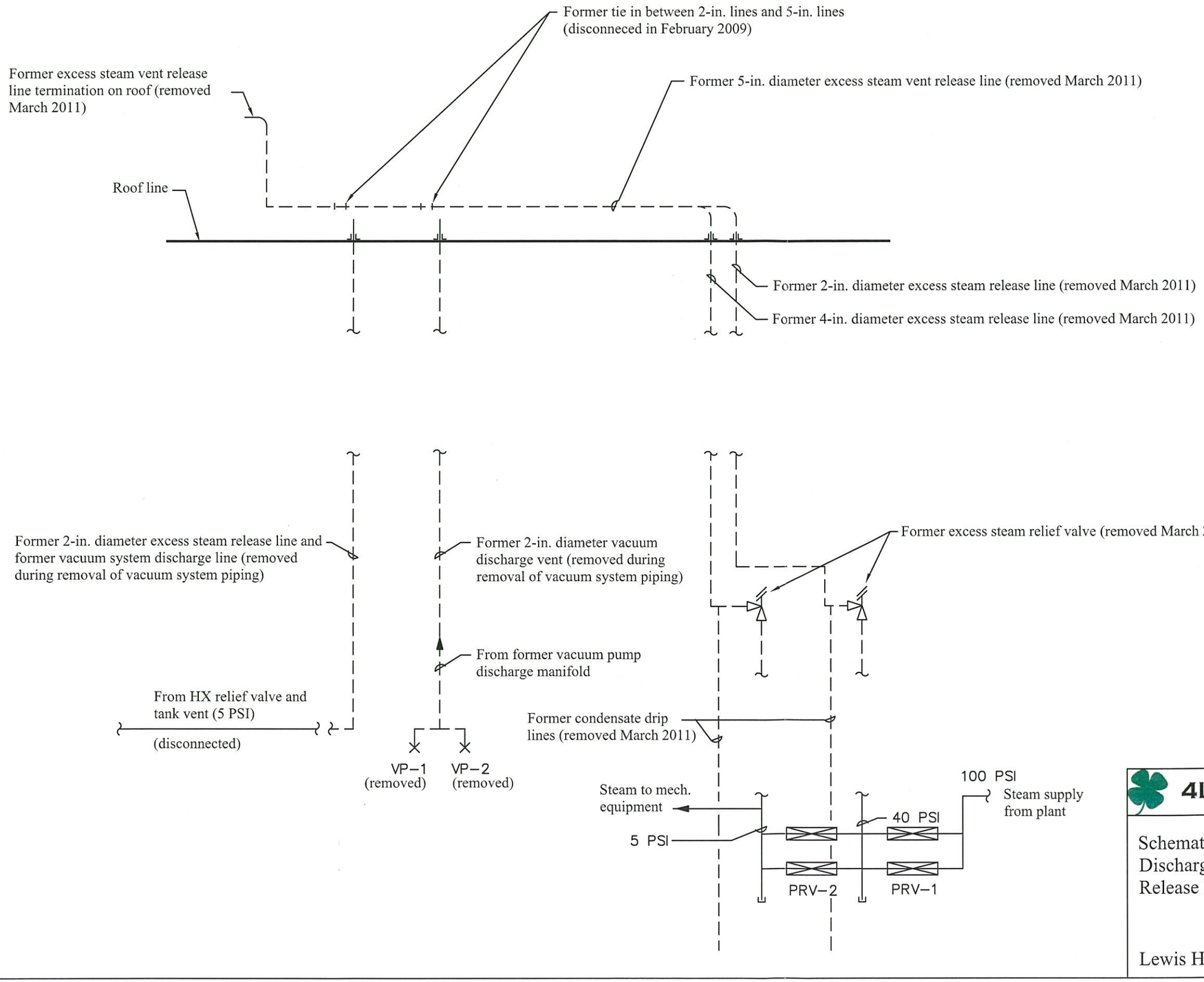


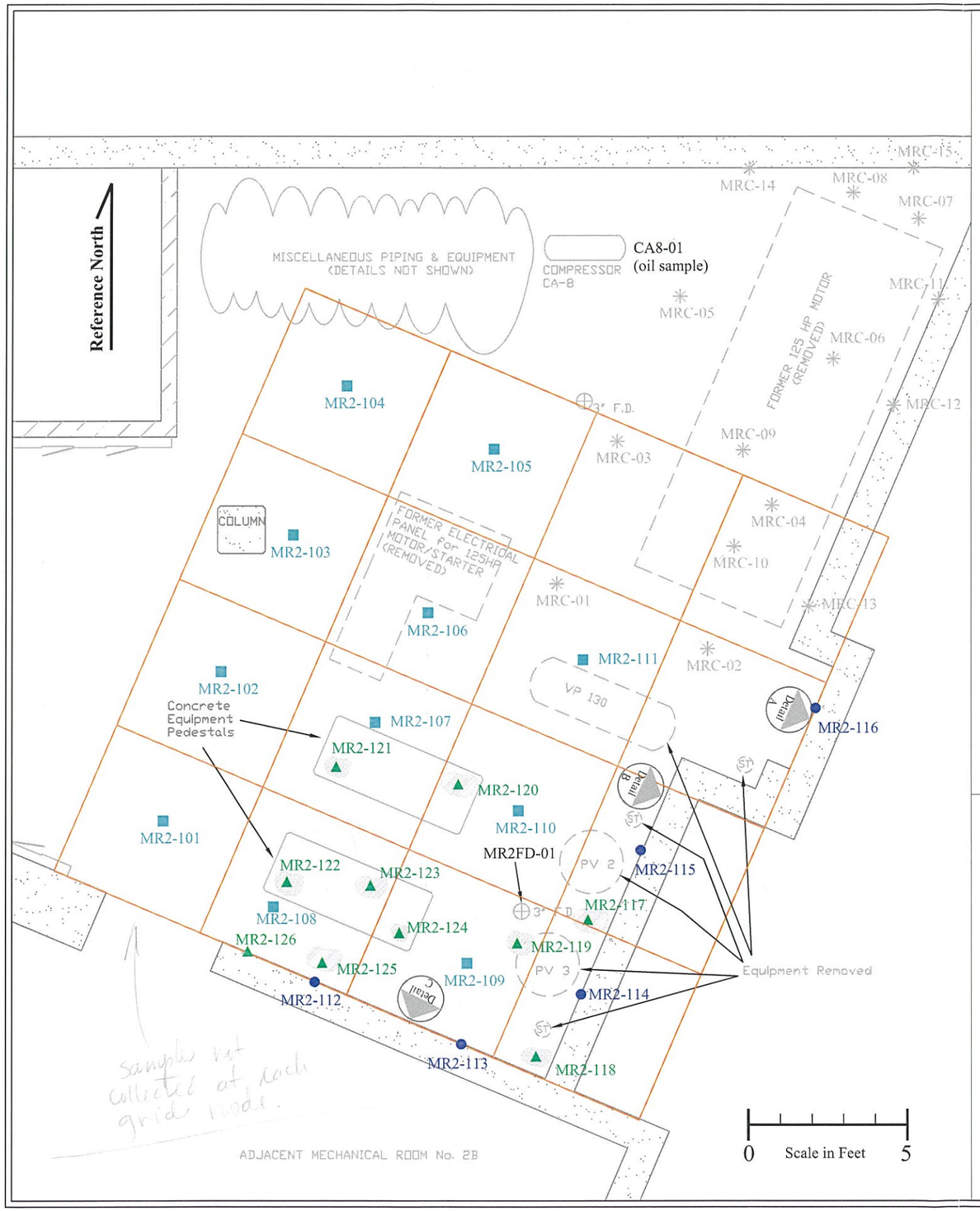
Figure 1. Site Vicinity Map of Lewis Hall on UC Berkeley Central Campus.

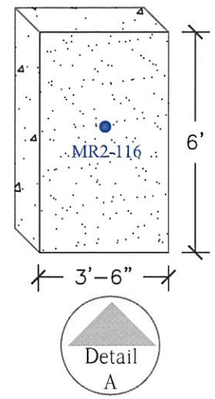


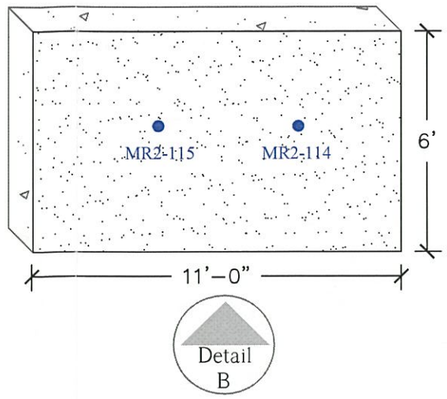
4LEAF, INC. FIGURE 2

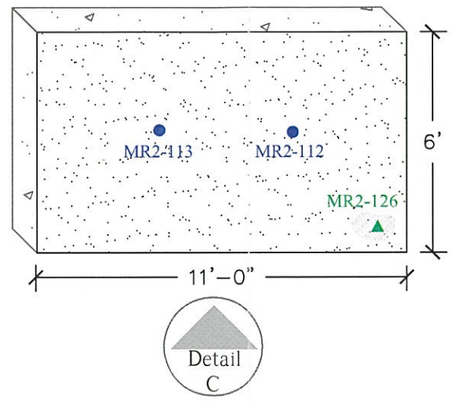
Schematic of Former Vacuum System Discharge Line and Excess Steam Vent Release Lines

Lewis Hall, UC Berkeley Central Campus









LEGEND

- 5-ft by 5-ft grid superimposed over proposed sampling area
- Location of visible staining on concrete floor or wall surface
- ▲ Proposed bulk concrete sample from location of visibly-stained floor or wall surface
- ■ Proposed bulk concrete sample from randomly-selected location along floor surface
- ● Proposed bulk concrete sample from randomly-selected location along wall surface
- ✳ Bulk concrete sample collected from floor or wall in north wall of Mechanical Room in April 2010 (approximate)

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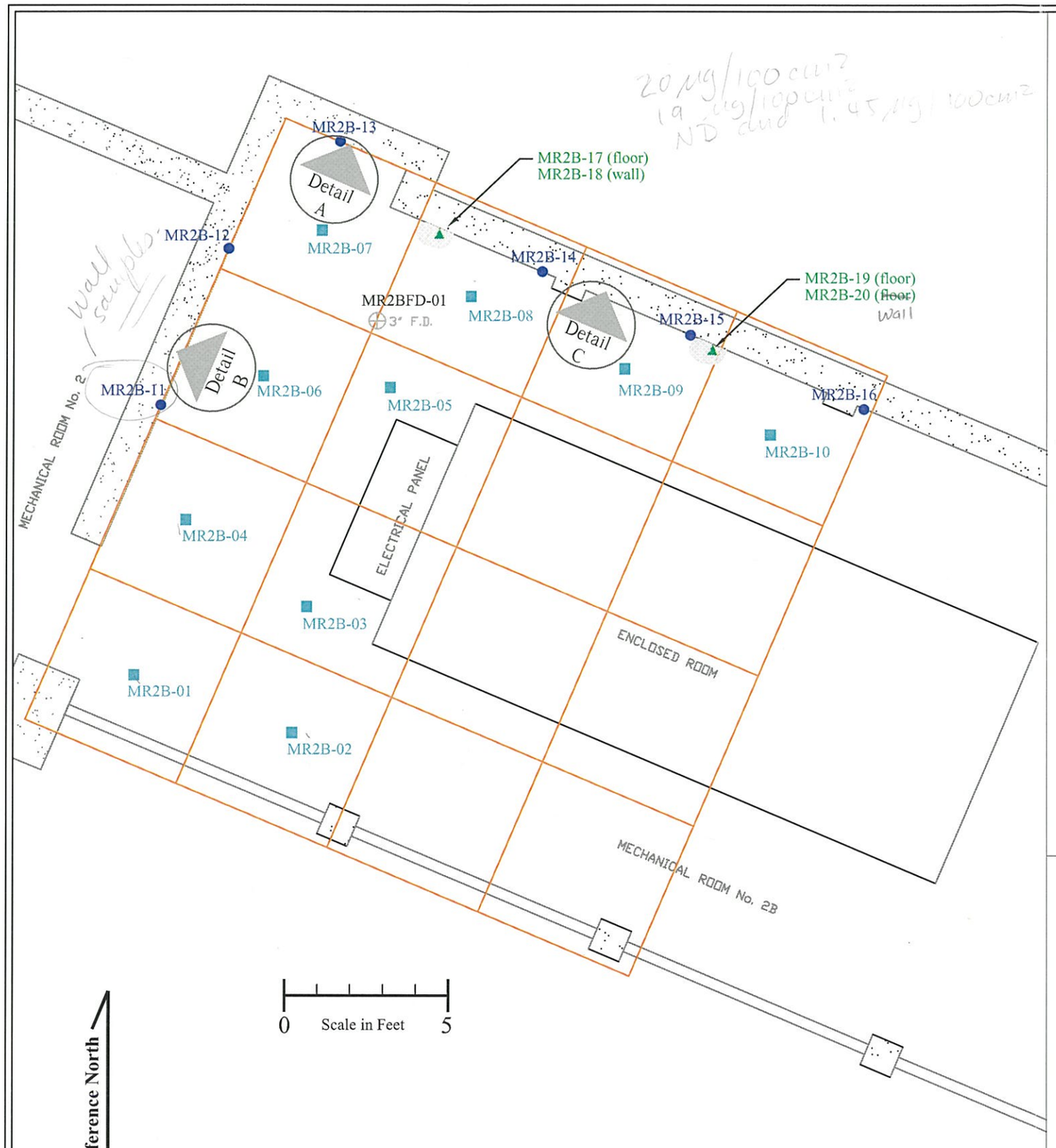
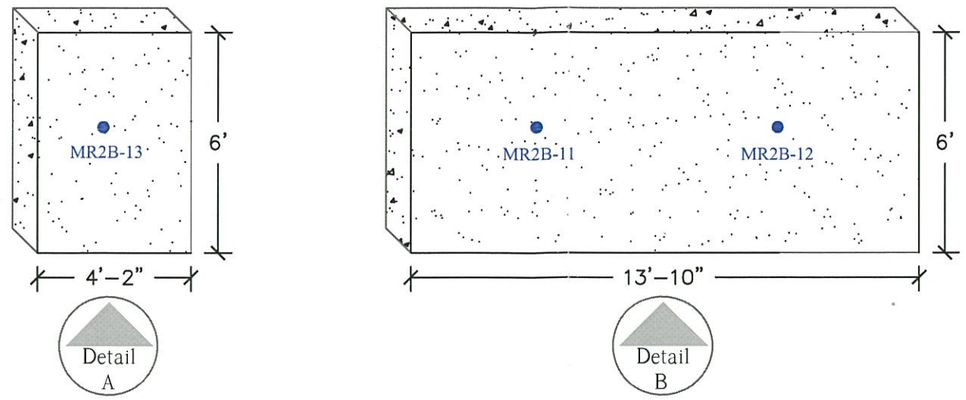
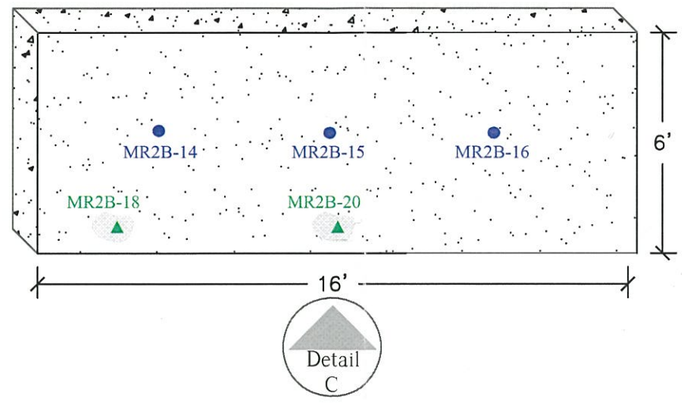
FIGURE 3

Revised Proposed Locations of Bulk Concrete Samples, Floor Drain Sample, and Air Compressor Oil Sample in Southern Portion of Mechanical Room No. 2

Lewis Hall, UC Berkeley Central Campus







1/4" per Foot

LEGEND

5-ft by 5-ft grid superimposed over proposed sampling area

Location of visible staining on concrete floor or wall surface

Proposed bulk concrete sample from location of visibly-stained floor or wall surface

Proposed bulk concrete sample from randomly-selected location along floor surface

Proposed bulk concrete sample from randomly-selected location along wall surface

4LEAF, INC.

FIGURE 4

Proposed Locations of Bulk Concrete Samples and Floor Drain Wipe Sample in Mechanical Room No. 2B.

Lewis Hall, UC Berkeley Central Campus

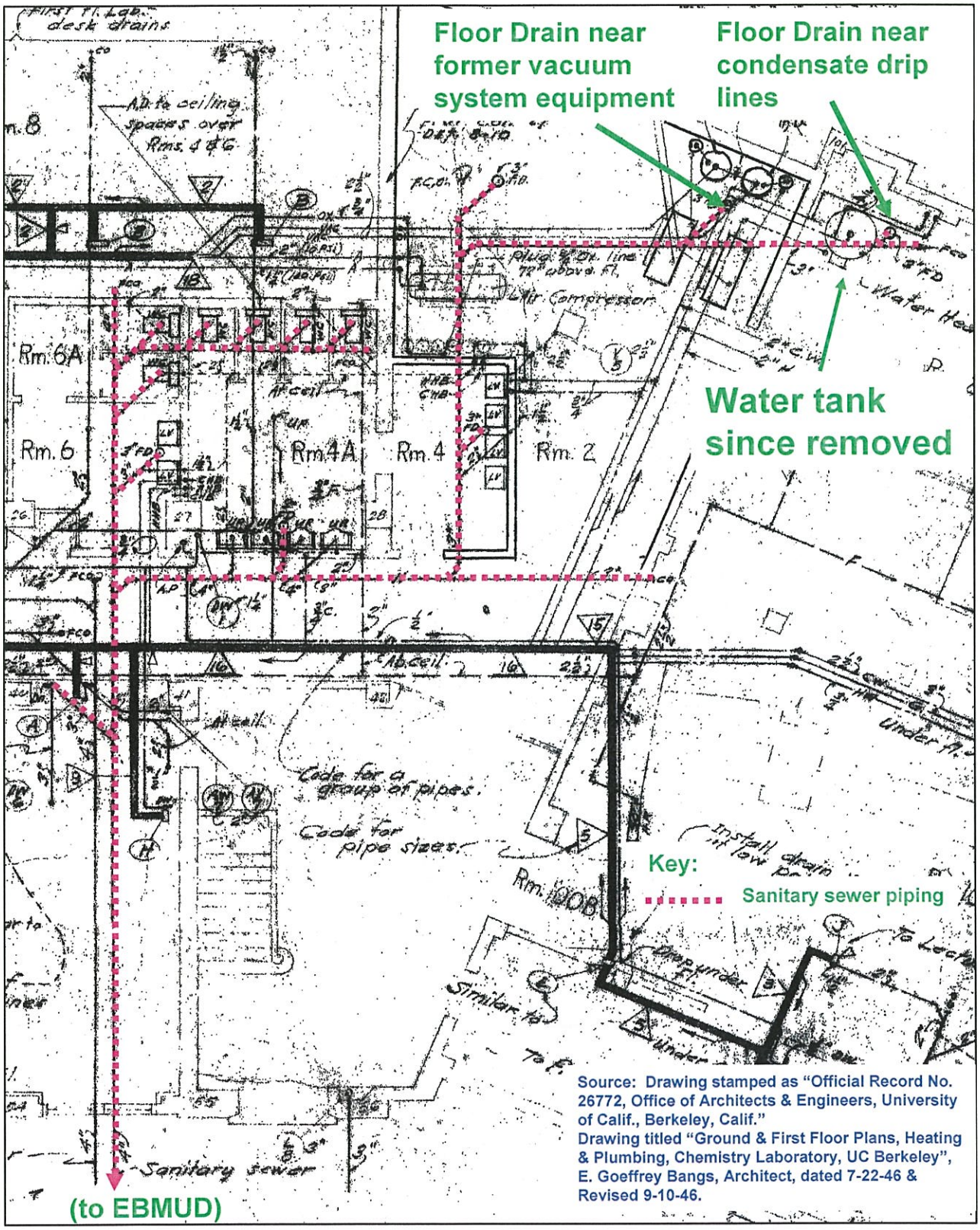
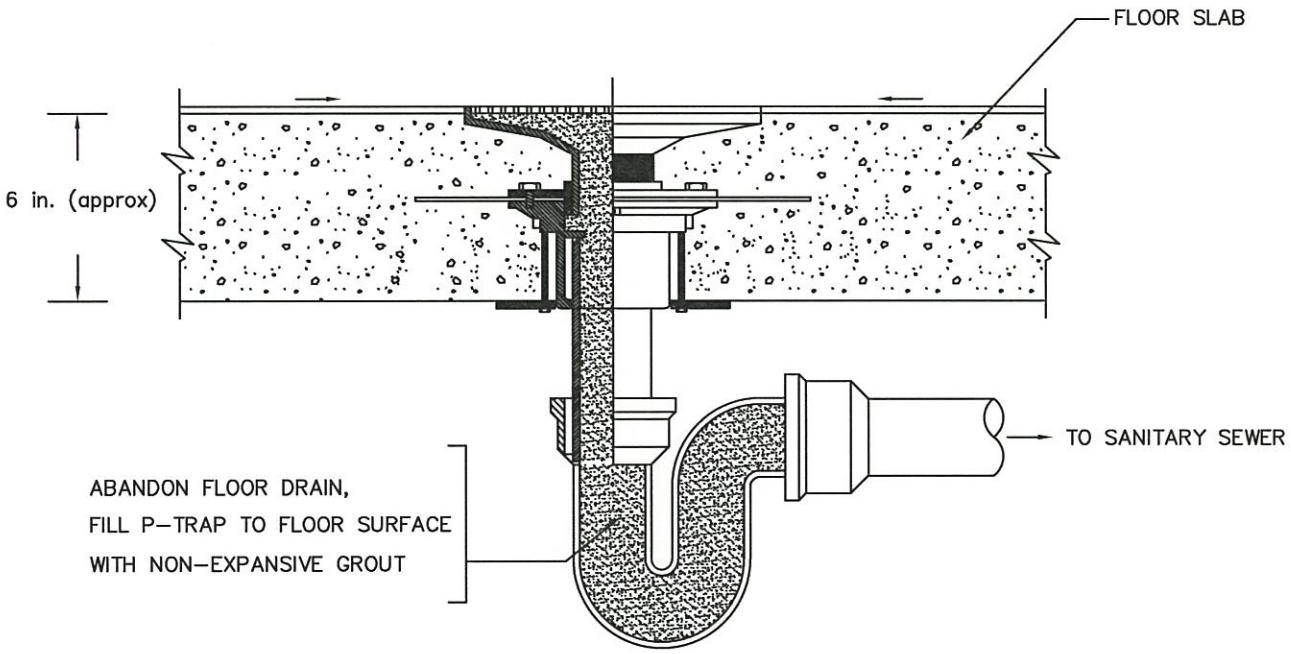


Figure 5. Schematic of sanitary sewer piping beneath the Ground Floor along the southern portion of Lewis Hall.



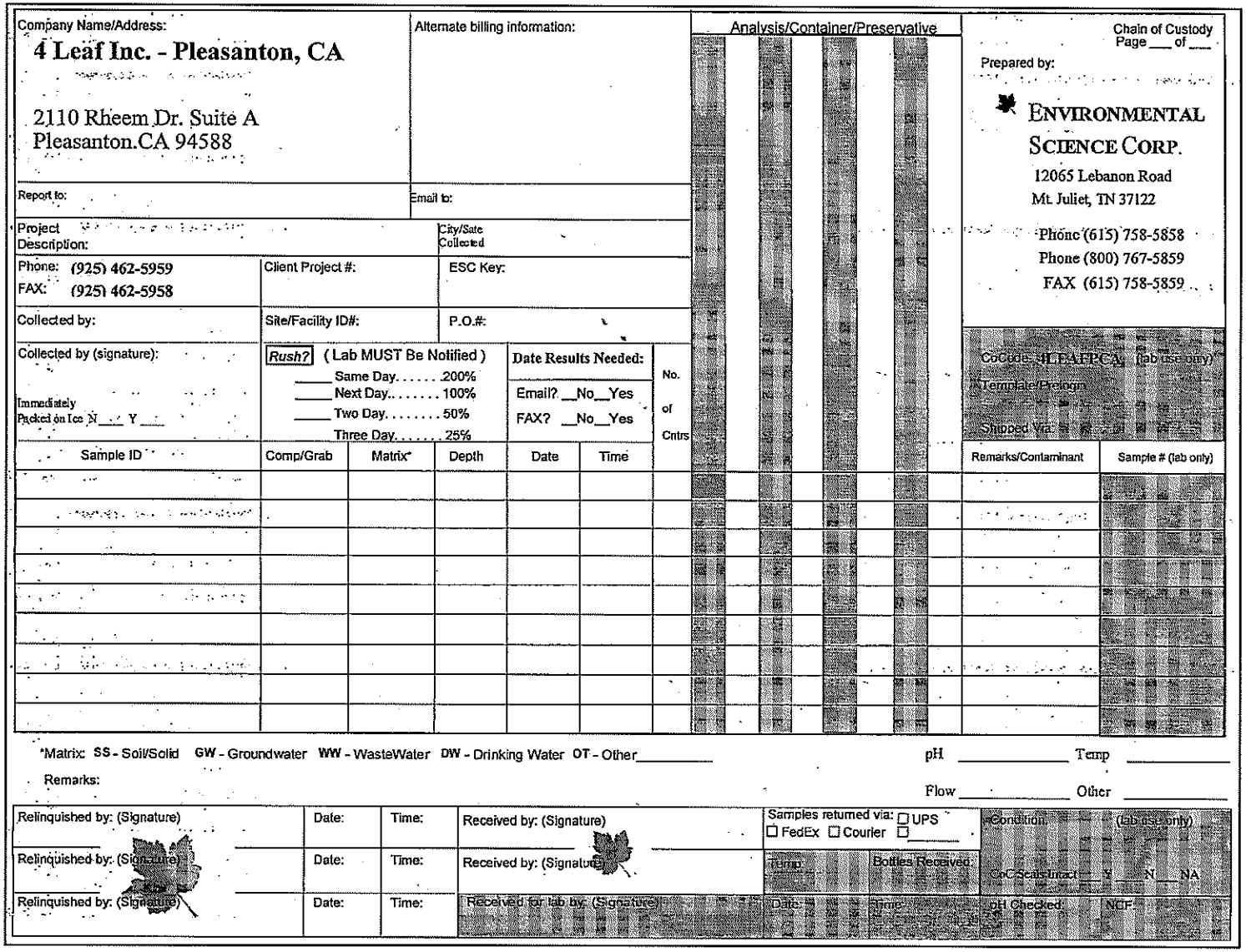
FLOOR DRAIN DETAIL (Typical)

Not To Scale

4LEAF, INC. | FIGURE 6

Schematic of Floor Drains on the Ground Floor of Lewis Hall (typical)

Lewis Hall, UC Berkeley Central Campus



Company Name/Address:
4 Leaf Inc. - Pleasanton, CA

2110 Rheem Dr. Suite A
Pleasanton.CA 94588

Alternate billing information:

Analysis/Container/Preservative

Chain of Custody
Page ___ of ___

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Project Description:

City/State Collected

Phone: (925) 462-5959
FAX: (925) 462-5958

Client Project #:

ESC Key:

Collected by:

Site/Facility ID#:

P.O.#:

Collected by (signature):

Immediately Packed on Ice N ___ Y ___

Rush? (Lab MUST Be Notified)
___ Same Day..... 200%
___ Next Day..... 100%
___ Two Day..... 50%
___ Three Day..... 25%

Date Results Needed:

Email? __No__Yes
FAX? __No__Yes

No. of Cntrs

CoCode: HLEAFPCA (lab use only)
Template/Prelogin
Shipped Via:

Sample ID	Comp/Grab	Matrix*	Depth	Date	Time		Remarks/Contaminant	Sample # (lab only)

*Matrix: SS - Soil/Solid GW - Groundwater WW - WasteWater DW - Drinking Water OT - Other_____

pH _____ Temp _____

Remarks:

Flow _____ Other _____

Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Samples returned via: ☐ UPS ☐ FedEx ☐ Courier ☐ _____	Condition: (lab use only)
Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Temp: Bottles Received:	COC Seals Intact: ___ Y ___ N ___ NA
Relinquished by: (Signature)	Date:	Time:	Received for lab by: (Signature)	Date: Time:	pH Checked: NCF:

Figure 7. Example COC form.

Table 1
Sample Register - Bulk Concrete Samples and QC Samples, Mechanical Room No. 2 and Mechanical Room No. 2B, Lewis Hall, UC Berkeley, CA

Sample Description	Sample Location ID	Sample ID	Sample Depth (in.)	Sample Type	Analysis	Notes
Bulk Concrete Characterization Samples - Mechanical Room No. 2						
Bulk concrete characterization samples from a **randomly-selected floor surface location** within 5- by 5-ft grids.	MR2-101	MR2-101-01	0.25	Bulk Concrete	PCBs	MR2 - Denotes Mechanical Room No. 2 bulk concrete characterization sample location.
		MR2-101-02	0.5	Bulk Concrete	PCBs	
Bulk concrete characterization samples from a **randomly-selected floor surface location** within 5- by 5-ft grids.	MR2-102	MR2-102-01	0.25	Bulk Concrete	PCBs	
		MR2-102-02	0.5	Bulk Concrete	PCBs	
Bulk concrete characterization samples from a **randomly-selected floor surface location** within 5- by 5-ft grids.	MR2-103	MR2-103-01	0.25	Bulk Concrete	PCBs	Field duplicate to also be collected at this location for the sample at 0.25 in. depth (see Field Quality Control Samples).
		MR2-103-02	0.5	Bulk Concrete	PCBs	
Bulk concrete characterization samples from a **randomly-selected floor surface location** within 5- by 5-ft grids.	MR2-104	MR2-104-01	0.25	Bulk Concrete	PCBs	
		MR2-104-02	0.5	Bulk Concrete	PCBs	
Bulk concrete characterization samples from a **randomly-selected floor surface location** within 5- by 5-ft grids.	MR2-105	MR2-105-01	0.25	Bulk Concrete	PCBs	
		MR2-105-02	0.5	Bulk Concrete	PCBs	
Bulk concrete characterization samples from a **randomly-selected floor surface location** within 5- by 5-ft grids.	MR2-106	MR2-106-01	0.25	Bulk Concrete	PCBs	
		MR2-106-02	0.5	Bulk Concrete	PCBs	
Bulk concrete characterization samples from a **randomly-selected floor surface location** within 5- by 5-ft grids.	MR2-107	MR2-107-01	0.25	Bulk Concrete	PCBs	Field duplicate to also be collected at this location for the sample at 0.25 in. depth (see Field Quality Control Samples).
		MR2-107-02	0.5	Bulk Concrete	PCBs	
Bulk concrete characterization samples from a **randomly-selected floor surface location** within 5- by 5-ft grids.	MR2-108	MR2-108-01	0.25	Bulk Concrete	PCBs	
		MR2-108-02	0.5	Bulk Concrete	PCBs	
Bulk concrete characterization samples from a **randomly-selected floor surface location** within 5- by 5-ft grids.	MR2-109	MR2-109-01	0.25	Bulk Concrete	PCBs	
		MR2-109-02	0.5	Bulk Concrete	PCBs	
Bulk concrete characterization samples from a **randomly-selected floor surface location** within 5- by 5-ft grids.	MR2-110	MR2-110-01	0.25	Bulk Concrete	PCBs	
		MR2-110-02	0.5	Bulk Concrete	PCBs	

Table 1
Sample Register - Bulk Concrete Samples and QC Samples, Mechanical Room No. 2 and Mechanical Room No. 2B, Lewis Hall, UC Berkeley, CA

Sample Description	Sample Location ID	Sample ID	Sample Depth (in.)	Sample Type	Analysis	Notes
Bulk concrete characterization samples from a **randomly-selected floor surface location** within 5- by 5-ft grids.	MR2-111	MR2-111-01	0.25	Bulk Concrete	PCBs	
		MR2-111-02	0.5	Bulk Concrete	PCBs	
Bulk concrete characterization samples from a **randomly-selected wall surface location**.	MR2-112	MR2-112-01	0.25	Bulk Concrete	PCBs	
		MR2-112-02	0.5	Bulk Concrete	PCBs	
Bulk concrete characterization samples from a **randomly-selected wall surface location**.	MR2-113	MR2-113-01	0.25	Bulk Concrete	PCBs	Field duplicate to also be collected at this location for the sample at 0.25 in. depth (see Field Quality Control Samples).
		MR2-113-02	0.5	Bulk Concrete	PCBs	
Bulk concrete characterization samples from a **randomly-selected wall surface location**.	MR2-114	MR2-114-01	0.25	Bulk Concrete	PCBs	
		MR2-114-02	0.5	Bulk Concrete	PCBs	
Bulk concrete characterization samples from a **randomly-selected wall surface location**.	MR2-115	MR2-115-01	0.25	Bulk Concrete	PCBs	
		MR2-115-02	0.5	Bulk Concrete	PCBs	
Bulk concrete characterization samples from a **randomly-selected wall surface location**.	MR2-116	MR2-116-01	0.25	Bulk Concrete	PCBs	
		MR2-116-02	0.5	Bulk Concrete	PCBs	
Bulk concrete characterization samples from a **visibly-stained concrete floor surface**.	MR2-117	MR2-117-01	0.25	Bulk Concrete	PCBs	
		MR2-117-02	0.5	Bulk Concrete	PCBs	
Bulk concrete characterization samples from a **visibly-stained concrete floor surface**.	MR2-118	MR2-118-01	0.25	Bulk Concrete	PCBs	
		MR2-118-02	0.5	Bulk Concrete	PCBs	
Bulk concrete characterization samples from a **visibly-stained concrete floor surface**.	MR2-119	MR2-119-01	0.25	Bulk Concrete	PCBs	
		MR2-119-02	0.5	Bulk Concrete	PCBs	
Bulk concrete characterization samples from a **visibly-stained concrete surface of former vacuum pump pedestal.**	MR2-120	MR2-120-01	0.25	Bulk Concrete	PCBs	Field duplicate to also be collected at this location for the sample at 0.25 in. depth (see Field Quality Control Samples).
		MR2-120-02	0.5	Bulk Concrete	PCBs	
Bulk concrete characterization samples from a **visibly-stained concrete surface of former vacuum pump pedestal.**	MR2-121	MR2-121-01	0.25	Bulk Concrete	PCBs	
		MR2-121-02	0.5	Bulk Concrete	PCBs	

Table 1
Sample Register - Bulk Concrete Samples and QC Samples, Mechanical Room No. 2 and Mechanical Room No. 2B, Lewis Hall, UC Berkeley, CA

Sample Description	Sample Location ID	Sample ID	Sample Depth (in.)	Sample Type	Analysis	Notes
Bulk concrete characterization samples from a **visibly-stained concrete surface of former vacuum pump pedestal.**	MR2-122	MR2-122-01	0.25	Bulk Concrete	PCBs	
		MR2-122-02	0.5	Bulk Concrete	PCBs	
Bulk concrete characterization samples from a **visibly-stained concrete surface of former vacuum pump pedestal.**	MR2-123	MR2-123-01	0.25	Bulk Concrete	PCBs	Field duplicate to also be collected at this location for the sample at 0.25 in. depth (see Field Quality Control Samples).
		MR2-123-02	0.5	Bulk Concrete	PCBs	
Bulk concrete characterization samples from a **visibly-stained concrete surface of former vacuum pump pedestal.**	MR2-124	MR2-124-01	0.25	Bulk Concrete	PCBs	
		MR2-124-02	0.5	Bulk Concrete	PCBs	
Bulk concrete characterization samples from a **visibly-stained concrete floor surface.**	MR2-125	MR2-125-01	0.25	Bulk Concrete	PCBs	
		MR2-125-02	0.5	Bulk Concrete	PCBs	
Bulk concrete characterization samples from a **visibly-stained concrete wall surface.**	MR2-126	MR2-126-01	0.25	Bulk Concrete	PCBs	Field duplicate to also be collected at this location for the sample at 0.25 in. depth (see Field Quality Control Samples).
		MR2-126-02	0.5	Bulk Concrete	PCBs	
Bulk Concrete Characterization Samples - Mechanical Room No. 2B						
Bulk concrete characterization samples from a **randomly-selected floor surface location** within 5- by 5-ft grids.	MR2B-01	MR2B-01-01	0.25	Bulk Concrete	PCBs	
		MR2B-01-02	0.5	Bulk Concrete	PCBs	
Bulk concrete characterization samples from a **randomly-selected floor surface location** within 5- by 5-ft grids.	MR2B-02	MR2B-02-01	0.25	Bulk Concrete	PCBs	
		MR2B-02-02	0.5	Bulk Concrete	PCBs	
Bulk concrete characterization samples from a **randomly-selected floor surface location** within 5- by 5-ft grids.	MR2B-03	MR2B-03-01	0.25	Bulk Concrete	PCBs	
		MR2B-03-02	0.5	Bulk Concrete	PCBs	
Bulk concrete characterization samples from a **randomly-selected floor surface location** within 5- by 5-ft grids.	MR2B-04	MR2B-04-01	0.25	Bulk Concrete	PCBs	
		MR2B-04-02	0.5	Bulk Concrete	PCBs	
Bulk concrete characterization samples from a **randomly-selected floor surface location** within 5- by 5-ft grids.	MR2B-05	MR2B-05-01	0.25	Bulk Concrete	PCBs	
		MR2B-05-02	0.5	Bulk Concrete	PCBs	

Table 1
Sample Register - Bulk Concrete Samples and QC Samples, Mechanical Room No. 2 and Mechanical Room No. 2B, Lewis Hall, UC Berkeley, CA

Sample Description	Sample Location ID	Sample ID	Sample Depth (in.)	Sample Type	Analysis	Notes
Bulk concrete characterization samples from a **randomly-selected floor surface location** within 5- by 5-ft grids.	MR2B-06	MR2B-06-01	0.25	Bulk Concrete	PCBs	
		MR2B-06-02	0.5	Bulk Concrete	PCBs	
Bulk concrete characterization samples from a **randomly-selected floor surface location** within 5- by 5-ft grids.	MR2B-07	MR2B-07-01	0.25	Bulk Concrete	PCBs	
		MR2B-07-02	0.5	Bulk Concrete	PCBs	
Bulk concrete characterization samples from a **randomly-selected floor surface location** within 5- by 5-ft grids.	MR2B-08	MR2B-08-01	0.25	Bulk Concrete	PCBs	
		MR2B-08-02	0.5	Bulk Concrete	PCBs	
Bulk concrete characterization samples from a **randomly-selected floor surface location** within 5- by 5-ft grids.	MR2B-09	MR2B-09-01	0.25	Bulk Concrete	PCBs	
		MR2B-09-02	0.5	Bulk Concrete	PCBs	
Bulk concrete characterization samples from a **randomly-selected floor surface location** within 5- by 5-ft grids.	MR2B-10	MR2B-10-01	0.25	Bulk Concrete	PCBs	
		MR2B-10-02	0.5	Bulk Concrete	PCBs	
Bulk concrete characterization samples from a **randomly-selected wall surface location**.	MR2B-11	MR2B-11-01	0.25	Bulk Concrete	PCBs	
		MR2B-11-02	0.5	Bulk Concrete	PCBs	
Bulk concrete characterization samples from a **randomly-selected wall surface location**.	MR2B-12	MR2B-12-01	0.25	Bulk Concrete	PCBs	
		MR2B-12-02	0.5	Bulk Concrete	PCBs	
Bulk concrete characterization samples from a **randomly-selected wall surface location**.	MR2B-13	MR2B-13-01	0.25	Bulk Concrete	PCBs	
		MR2B-13-02	0.5	Bulk Concrete	PCBs	
Bulk concrete characterization samples from a **randomly-selected wall surface location**.	MR2B-14	MR2B-14-01	0.25	Bulk Concrete	PCBs	
		MR2B-14-02	0.5	Bulk Concrete	PCBs	
Bulk concrete characterization samples from a **randomly-selected wall surface location**.	MR2B-15	MR2B-15-01	0.25	Bulk Concrete	PCBs	
		MR2B-15-02	0.5	Bulk Concrete	PCBs	
Bulk concrete characterization samples from a **randomly-selected wall surface location**.	MR2B-16	MR2B-16-01	0.25	Bulk Concrete	PCBs	
		MR2B-16-02	0.5	Bulk Concrete	PCBs	

Table 1
Sample Register - Bulk Concrete Samples and QC Samples, Mechanical Room No. 2 and Mechanical Room No. 2B, Lewis Hall, UC Berkeley, CA

Sample Description	Sample Location ID	Sample ID	Sample Depth (in.)	Sample Type	Analysis	Notes
Bulk concrete characterization samples from the **visibly-stained concrete floor surface beneath the former condensate drip line for the removed 4-in. excess steam vent release line.**	MR2B-17	MR2B-17-01	0.25	Bulk Concrete	PCBs	
		MR2B-17-02	0.5	Bulk Concrete	PCBs	
Bulk concrete characterization samples from a **visibly-stained concrete wall surface beneath the former condensate drip line for the removed 4-in. excess steam vent release line.**	MR2B-18	MR2B-18-01	0.25	Bulk Concrete	PCBs	
		MR2B-18-02	0.5	Bulk Concrete	PCBs	
Bulk concrete characterization samples from a **visibly-stained concrete floor surface beneath the former condensate drip line for the removed 2-in. excess steam vent release line.**	MR2B-19	MR2B-19-01	0.25	Bulk Concrete	PCBs	
		MR2B-19-02	0.5	Bulk Concrete	PCBs	
Bulk concrete characterization samples from a **visibly-stained concrete wall surface beneath the former condensate drip line for the removed 4-in. excess steam vent release line.**	MR2B-20	MR2B-20-01	0.25	Bulk Concrete	PCBs	
		MR2B-20-02	0.5	Bulk Concrete	PCBs	

Table 1
Sample Register - Bulk Concrete Samples and QC Samples, Mechanical Room No. 2 and Mechanical Room No. 2B, Lewis Hall, UC Berkeley, CA

Sample Description	Sample Location ID	Sample ID	Sample Depth (in.)	Sample Type	Analysis	Notes
Field Quality Control Samples						
Field Duplicates						
Bulk concrete characterization samples from randomly-selected floor surface location within 5- by 5-ft grid in Mechanical Room No. 2.	MR2-103	MR2-103-03	0.25	Bulk Concrete	PCBs	
Bulk concrete characterization samples from randomly-selected floor surface location within 5- by 5-ft grid in Mechanical Room No. 2.	MR2-107	MR2-107-03	0.25	Bulk Concrete	PCBs	
Bulk concrete characterization samples from randomly-selected wall surface location in Mechanical Room No. 2.	MR2-113	MR2-113-03	0.25	Bulk Concrete	PCBs	
Bulk concrete characterization samples from visibly-stained concrete surface of former vacuum pump pedestal in Mechanical Room No. 2.	MR2-120	MR2-120-03	0.25	Bulk Concrete	PCBs	
Bulk concrete characterization samples from visibly-stained concrete surface of former vacuum pump pedestal in Mechanical Room No. 2.	MR2-123	MR2-123-03	0.25	Bulk Concrete	PCBs	
Bulk concrete characterization samples from visibly-stained concrete wall surface in Mechanical Room No. 2.	MR2-126	MR2-126-03	0.25	Bulk Concrete	PCBs	
Bulk concrete characterization samples from randomly-selected floor surface location within 5- by 5-ft grid in Mechanical Room No. 2B.	MR2B-04	MR2B-04-03	0.25	Bulk Concrete	PCBs	
Bulk concrete characterization samples from randomly-selected floor surface location within 5- by 5-ft grid in Mechanical Room No. 2B.	MR2B-08	MR2B-08-03	0.25	Bulk Concrete	PCBs	
Bulk concrete characterization samples from randomly-selected wall surface location in Mechanical Room No. 2B.	MR2B-12	MR2B-12-03	0.25	Bulk Concrete	PCBs	

Table 1
Sample Register - Bulk Concrete Samples and QC Samples, Mechanical Room No. 2 and Mechanical Room No. 2B, Lewis Hall, UC Berkeley, CA

Sample Description	Sample Location ID	Sample ID	Sample Depth (in.)	Sample Type	Analysis	Notes
Bulk concrete characterization samples from randomly-selected wall surface location in Mechanical Room No. 2B.	MR2B-15	MR2B-15-03	0.25	Bulk Concrete	PCBs	
Equipment Rinsate Blanks						
	TBD	MR2-RB-101	NA	Water	PCBs	One rinsate sample collected per day from decontaminated field equipment used for bulk concrete sampling.
	TBD	MR2-RB-102	NA	Water	PCBs	Same as above.
	TBD	MR2-RB-103	NA	Water	PCBs	Same as above.
	TBD	MR2B-RB-01	NA	Water	PCBs	Same as above.
	TBD	MR2B-RB-02	NA	Water	PCBs	Same as above.
	TBD	MR2B-RB-03	NA	Water	PCBs	Same as above.

Table 2
Sample Register - Floor Drain Samples, Mechanical Room No. 2 and Mechanical Room No. 2B, Lewis Hall, UC Berkeley, CA

Sample Description	Sample Location ID	Sample ID	Sample Depth (in.)	Sample Type	Analysis	Notes
Floor Drain Samples - Mechanical Room No. 2						
Wipe sample from inside surface of inlet piping for floor drain near former snubber tanks.	MR2FD-01	MR2FD-01	NA	Small Diameter Piping Wipe Sample	PCBs	
Sample of any loose sediment or material that is present on concrete surface around inlet to drain or inside of piping of drain near former snubber tanks.	MR2FD-02	MR2FD-02	NA	Sediment Sample	PCBs	Sample will only be collected and submitted for analysis if a sufficient volume of material is present and can be collected (approximately 25 grams).
Floor Drain Samples - Mechanical Room No. 2B						
Wipe sample from inside surface of inlet piping for floor drain near former condensate drip line for removed 4-in. diameter excess steam vent release line.	MR2BFD-01	MR2BFD-01	NA	Small Diameter Piping Wipe Sample	PCBs	
Sample of any loose sediment or material that is present on concrete surface around inlet to drain or inside of piping of drain near former condensate drip line for removed 4-in. diameter excess steam vent release line.	MR2BFD-02	MR2BFD-02	NA	Sediment Sample	PCBs	Sample will only be collected and submitted for analysis if a sufficient volume of material is present and can be collected (approximately 25 grams).

Table 3
Sample Register - Surface Wipe and QC Samples
Lewis Hall, UC Berkeley, CA

Sample Description	Sample Location ID	Sample ID	Sample Depth (in.)	Sample Type	Analysis	Notes
Surface Wipe Samples						
Wipe samples collected from 5 locations from laboratory benchtops in Room 38.	RM38-BT-01	RM38-BT-01-A	NA	Surface Wipe	PCBs	'BT' - denotes laboratory bench tops. COC form will note that the samples will be composited by analytical laboratory into one sample.
		RM38-BT-01-B	NA	Surface Wipe	PCBs	
		RM38-BT-01-C	NA	Surface Wipe	PCBs	
		RM38-BT-01-D	NA	Surface Wipe	PCBs	
		RM38-BT-01-E	NA	Surface Wipe	PCBs	
Wipe samples collected from 5 locations from surfaces on inside of fume hood in Room 38.	RM38-FH-01	RM38-FH-01A	NA	Surface Wipe	PCBs	'FH' - denotes laboratory fume hoods. Samples will be composited by analytical laboratory into one sample.
		RM38-FH-01B	NA	Surface Wipe	PCBs	
		RM38-FH-01C	NA	Surface Wipe	PCBs	
		RM38-FH-01D	NA	Surface Wipe	PCBs	
		RM38-FH-01E	NA	Surface Wipe	PCBs	
Wipe samples collected from 5 locations from laboratory benchtops in Room 12.	RM12-BT-01	RM12-BT-01-A	NA	Surface Wipe	PCBs	COC form will note that the samples will be composited by analytical laboratory into one sample. A Field Duplicate sample will also be collected from this location (see QC samples below).
		RM12-BT-01-B	NA	Surface Wipe	PCBs	
		RM12-BT-01-C	NA	Surface Wipe	PCBs	
		RM12-BT-01-D	NA	Surface Wipe	PCBs	
		RM12-BT-01-E	NA	Surface Wipe	PCBs	
Wipe samples collected from 5 locations from surfaces on inside of fume hood in Room 12.	RM12-FH-01	RM12-FH-01A	NA	Surface Wipe	PCBs	COC form will note that samples will be composited by analytical laboratory into one sample.
		RM12-FH-01B	NA	Surface Wipe	PCBs	
		RM12-FH-01C	NA	Surface Wipe	PCBs	
		RM12-FH-01D	NA	Surface Wipe	PCBs	
		RM12-FH-01E	NA	Surface Wipe	PCBs	

Table 3
Sample Register - Surface Wipe and QC Samples
Lewis Hall, UC Berkeley, CA

Sample Description	Sample Location ID	Sample ID	Sample Depth (in.)	Sample Type	Analysis	Notes
Surface Wipe Samples (continued)						
Wipe samples collected from 5 locations from laboratory benchtops in Room 106.	RM106-BT-01	RM106-BT-01-A	NA	Surface Wipe	PCBs	COC form will note that samples will be composited by analytical laboratory into one sample.
		RM106-BT-01-B	NA	Surface Wipe	PCBs	
		RM106-BT-01-C	NA	Surface Wipe	PCBs	
		RM106-BT-01-D	NA	Surface Wipe	PCBs	
		RM106-BT-01-E	NA	Surface Wipe	PCBs	
Wipe samples collected from 5 locations from surfaces on inside of fume hood in Room 106.	RM106-FH-01	RM106-FH-01A	NA	Surface Wipe	PCBs	COC form will note that samples will be composited by analytical laboratory into one sample.
		RM106-FH-01B	NA	Surface Wipe	PCBs	
		RM106-FH-01C	NA	Surface Wipe	PCBs	
		RM106-FH-01D	NA	Surface Wipe	PCBs	
		RM106-FH-01E	NA	Surface Wipe	PCBs	
Wipe samples collected from 5 locations from laboratory benchtops in Room 111.	RM111-BT-01	RM111-BT-01-A	NA	Surface Wipe	PCBs	COC form will note that samples will be composited by analytical laboratory into one sample.
		RM111-BT-01-B	NA	Surface Wipe	PCBs	
		RM111-BT-01-C	NA	Surface Wipe	PCBs	
		RM111-BT-01-D	NA	Surface Wipe	PCBs	
		RM111-BT-01-E	NA	Surface Wipe	PCBs	
Wipe samples collected from 5 locations from surfaces on inside of fume hood in Room 111.	RM111-FH-01	RM111-FH-01A	NA	Surface Wipe	PCBs	COC form will note that samples will be composited by analytical laboratory into one sample.
		RM111-FH-01B	NA	Surface Wipe	PCBs	
		RM111-FH-01C	NA	Surface Wipe	PCBs	
		RM111-FH-01D	NA	Surface Wipe	PCBs	
		RM111-FH-01E	NA	Surface Wipe	PCBs	

Table 3
Sample Register - Surface Wipe and QC Samples
Lewis Hall, UC Berkeley, CA

Sample Description	Sample Location ID	Sample ID	Sample Depth (in.)	Sample Type	Analysis	Notes
Surface Wipe Samples (continued)						
Wipe samples collected from 5 locations from laboratory benchtops in Room 210.	RM120-BT-01	RM120-BT-01-A	NA	Surface Wipe	PCBs	COC form will note that samples will be composited by analytical laboratory into one sample.
		RM120-BT-01-B	NA	Surface Wipe	PCBs	
		RM120-BT-01-C	NA	Surface Wipe	PCBs	
		RM120-BT-01-D	NA	Surface Wipe	PCBs	
		RM120-BT-01-E	NA	Surface Wipe	PCBs	
Wipe samples collected from 5 locations from surfaces on inside of fume hood in Room 210.	RM120-FH-01	RM120-FH-01A	NA	Surface Wipe	PCBs	COC form will note that samples will be composited by analytical laboratory into one sample.
		RM120-FH-01B	NA	Surface Wipe	PCBs	
		RM120-FH-01C	NA	Surface Wipe	PCBs	
		RM120-FH-01D	NA	Surface Wipe	PCBs	
		RM120-FH-01E	NA	Surface Wipe	PCBs	
Wipe samples collected from 5 locations from laboratory benchtops in Room 210.	RM210-BT-01	RM210-BT-01-A	NA	Surface Wipe	PCBs	COC form will note that samples will be composited by analytical laboratory into one sample.
		RM210-BT-01-B	NA	Surface Wipe	PCBs	
		RM210-BT-01-C	NA	Surface Wipe	PCBs	
		RM210-BT-01-D	NA	Surface Wipe	PCBs	
		RM210-BT-01-E	NA	Surface Wipe	PCBs	
Wipe samples collected from 5 locations from surfaces on inside of fume hood in Room 210.	RM210-FH-01	RM210-FH-01A	NA	Surface Wipe	PCBs	COC form will note that samples will be composited by analytical laboratory into one sample.
		RM210-FH-01B	NA	Surface Wipe	PCBs	
		RM210-FH-01C	NA	Surface Wipe	PCBs	
		RM210-FH-01D	NA	Surface Wipe	PCBs	
		RM210-FH-01E	NA	Surface Wipe	PCBs	

Table 3
Sample Register - Surface Wipe and QC Samples
Lewis Hall, UC Berkeley, CA

Sample Description	Sample Location ID	Sample ID	Sample Depth (in.)	Sample Type	Analysis	Notes
Surface Wipe Samples (continued)						
Wipe samples collected from 5 locations from laboratory benchtops in Room 215.	RM215-BT-01	RM215-BT-01-A	NA	Surface Wipe	PCBs	COC form will note that samples will be composited by analytical laboratory into one sample. A Field Duplicate sample will also be collected from this location (see QC samples below).
		RM215-BT-01-B	NA	Surface Wipe	PCBs	
		RM215-BT-01-C	NA	Surface Wipe	PCBs	
		RM215-BT-01-D	NA	Surface Wipe	PCBs	
		RM215-BT-01-E	NA	Surface Wipe	PCBs	
Wipe samples collected from 5 locations from surfaces on inside of fume hood in Room 215.	RM215-FH-01	RM215-FH-01A	NA	Surface Wipe	PCBs	COC form will note that samples will be composited by analytical laboratory into one sample.
		RM215-FH-01B	NA	Surface Wipe	PCBs	
		RM215-FH-01C	NA	Surface Wipe	PCBs	
		RM215-FH-01D	NA	Surface Wipe	PCBs	
		RM215-FH-01E	NA	Surface Wipe	PCBs	
Wipe samples collected from 5 locations from laboratory benchtops in Room 306.	RM306-BT-01	RM306-BT-01-A	NA	Surface Wipe	PCBs	COC form will note that samples will be composited by analytical laboratory into one sample.
		RM306-BT-01-B	NA	Surface Wipe	PCBs	
		RM306-BT-01-C	NA	Surface Wipe	PCBs	
		RM306-BT-01-D	NA	Surface Wipe	PCBs	
		RM306-BT-01-E	NA	Surface Wipe	PCBs	
Wipe samples collected from 5 locations from surfaces on inside of fume hood in Room 306.	RM306-FH-01	RM306-FH-01A	NA	Surface Wipe	PCBs	COC form will note that samples will be composited by analytical laboratory into one sample.
		RM306-FH-01B	NA	Surface Wipe	PCBs	
		RM306-FH-01C	NA	Surface Wipe	PCBs	
		RM306-FH-01D	NA	Surface Wipe	PCBs	
		RM306-FH-01E	NA	Surface Wipe	PCBs	

Table 3
Sample Register - Surface Wipe and QC Samples
Lewis Hall, UC Berkeley, CA

Sample Description	Sample Location ID	Sample ID	Sample Depth (in.)	Sample Type	Analysis	Notes
Surface Wipe Samples (continued)						
Wipe samples collected from 5 locations from laboratory benchtops in Room 324.	RM324-BT-01	RM324-BT-01-A	NA	Surface Wipe	PCBs	COC form will note that samples will be composited by analytical laboratory into one sample.
		RM324-BT-01-B	NA	Surface Wipe	PCBs	
		RM324-BT-01-C	NA	Surface Wipe	PCBs	
		RM324-BT-01-D	NA	Surface Wipe	PCBs	
		RM324-BT-01-E	NA	Surface Wipe	PCBs	
Wipe samples collected from 5 locations from surfaces on inside of fume hood in Room 324.	RM324-FH-01	RM324-FH-01A	NA	Surface Wipe	PCBs	COC form will note that samples will be composited by analytical laboratory into one sample.
		RM324-FH-01B	NA	Surface Wipe	PCBs	
		RM324-FH-01C	NA	Surface Wipe	PCBs	
		RM324-FH-01D	NA	Surface Wipe	PCBs	
		RM324-FH-01E	NA	Surface Wipe	PCBs	

Table 3
Sample Register - Surface Wipe and QC Samples
Lewis Hall, UC Berkeley, CA

Sample Description	Sample Location ID	Sample ID	Sample Depth (in.)	Sample Type	Analysis	Notes
Field Quality Control Samples						
Field Duplicates						
Duplicate wipe samples collected at locations adjacent to the 5 locations that will be sampled from the laboratory bench tops in Room 12.	RM12-BT-01	RM12-BT-01-F	NA	Surface Wipe	PCBs	COC form will note that samples will be composited by analytical laboratory into one sample. Samples **will not** be identified as Field Duplicates.
		RM12-BT-01-G	NA	Surface Wipe	PCBs	
		RM12-BT-01-H	NA	Surface Wipe	PCBs	
		RM12-BT-01-I	NA	Surface Wipe	PCBs	
		RM12-BT-01-J	NA	Surface Wipe	PCBs	
Duplicate wipe samples collected at locations adjacent to the 5 locations that will be sampled from the laboratory bench tops in Room 215.	RM215-BT-01	RM215-BT-01-F	NA	Surface Wipe	PCBs	COC form will note that samples will be composited by analytical laboratory into one sample. Samples **will not** be identified as Field Duplicates.
		RM215-BT-01-G	NA	Surface Wipe	PCBs	
		RM215-BT-01-H	NA	Surface Wipe	PCBs	
		RM215-BT-01-I	NA	Surface Wipe	PCBs	
		RM215-BT-01-J	NA	Surface Wipe	PCBs	
Field Blanks						
Unopened glass vial w/ gauze submitted to laboratory.	NA	UGV-10	NA	Surface Wipe	PCBs	UGV - field blank wipe surface collected from unopened glass vial.
Glass vial w/ gauze submitted to laboratory.	NA	OGV-10	NA	Surface Wipe	PCBs	OGV - field blank wipe surface collected from opened glass vial.
Sample collected from uncontaminated surface.	NA	UCS-10	NA	Surface Wipe	PCBs	UCS - field blank wipe surface collected from uncontaminated surface.

Notes:

BT - laboratory bench top.

FH - laboratory fume hood.

UGV - field blank wipe surface collected from unopened glass vial.

OGV - field blank wipe surface collected from opened glass vial.

UCS - field blank wipe surface collected from uncontaminated surface.

Table 4
Sample Register - Compressor No. 8 Oil Sample, Mechanical Room No. 2, UC Berkeley, CA

Sample Description	Sample Location ID	Sample ID	Sample Depth (in.)	Sample Type	Analysis	Notes
Air Compressor Oil Sample - Mechanical Room						
Oil sample from air compressor CA-8 motor crank case.	CA8-01	CA8-01	NA	Oil Sample	PCBs	

Table 5
Sample Register - Air Monitoring Samples, Mechanical Room No. 2 and Mechanical Room No. 2B, Lewis Hall, UC Berkeley, CA

Sample Description	Sample Location ID	Sample ID	Sample Depth (in.)	Sample Type	Analysis
Personal Breathing Zone Air Samples					
Mechanical Room No. 2.	PBZ	PBZ-01-*Date*	N/A	Air	PCBs
Mechanical Room No. 2.	PBZ	PBZ-01-*Date*	N/A	Air	PCBs
Room-38	Room 38	PBZ-02-*Date*	N/A	Air	PCBs
Room-38	Room 38	PBZ-02-*Date*	N/A	Air	PCBs
Field Blank	QA Sample	PBZ-03-*Date*	N/A	Air	PCBs
Field Blank	QA Sample	PBZ-03-Date	N/A	Air	PCBs
Mechanical Room No. 2B.	PBZ	PBZ-04-*Date*	N/A	Air	PCBs
Mechanical Room No. 2B.	PBZ	PBZ-04-*Date*	N/A	Air	PCBs
Room-38	Room 38	PBZ-05-*Date*	N/A	Air	PCBs
Room-38	Room 38	PBZ-05-*Date*	N/A	Air	PCBs
Field Blank	QA Sample	PBZ-06-*Date*	N/A	Air	PCBs
Field Blank	QA Sample	PBZ-06-*Date*	N/A	Air	PCBs

Notes:

PBZ - personal breathing zone.
The Gilian Air pump will be placed on a book shelf in Room 38 that is located immediately adjacent to the Mechanical Room. Pump will be placed at height of approximately 4 feet. Pump will be calibrated and turned on and off at same approximate times that bulk concrete samples are collected from Rooms No. 2 and 2b.

A field blank sample will be collected and submitted with each day's set of air monitoring samples. The field blank is treated exactly like a normal sample except that no air is drawn through the Florisil tube. Both ends of the Florisil tube are broken and the tube is then placed in a laboratory-supplied clean glass vial.

Appendix A

Work Plan to EBMUD for Abandonment of Floor Drain Inlets

UNIVERSITY OF CALIFORNIA, BERKELEY

BERKELEY • DAVIS • IRVINE • LOS ANGELES • MERCED • RIVERSIDE • SAN DIEGO • SAN FRANCISCO

SANTA BARBARA • SANTA CRUZ

PHYSICAL PLANT—CAMPUS SERVICES

BERKELEY, CALIFORNIA 94720-1384

March 10, 2011

Ms. Deirdre Mena
East Bay Municipal Utility District
Environmental Services Division
P.O. Box 24055
Oakland, CA 94623-1055

Re: Proposed Work Plan to Abandon Two Floor Drains on Ground Floor of Lewis Hall, UC Berkeley Campus, Berkeley, CA.

Dear Ms. Mena:

This letter, prepared by the University of California, Berkeley (UC Berkeley) Office of Environment, Health, and Safety (EH&S), presents the proposed work plan to abandon two floor drains located on the Ground Floor of Lewis Hall on the UC Berkeley Central Campus (see Figure 1). Lewis Hall is currently occupied by UC Berkeley's College of Chemistry for office, laboratory, and laboratory support operations.

UC Berkeley has been in consultation with the United States Environmental Protection Agency (USEPA) Region IX since March 2009 to develop a Risk-Based Application Notice ("Application") to investigate and remove the in-house vacuum system after polychlorinated biphenyls (PCBs) were identified in the vacuum system piping and ancillary equipment in Lewis Hall Mechanical Room (Room 2). The building's vacuum system and all ancillary equipment in the four story building have since been removed.

The two floor drains are located inside the Mechanical Room in the vicinity of the former vacuum system equipment. Wipe samples taken from the concrete indicate that PCBs are present near the drains, and UC Berkeley would like to take the drains out of service prior to further characterization and decontamination of the concrete. The USEPA has requested that UC Berkeley receive approval from EBMUD to abandon the drains in place.

Background

UC Berkeley EH&S staff collected two liquid samples from a bucket that was used to contain a liquid that was released during pump maintenance in the Mechanical Room. Because maintenance employees were exposed to the liquid, the samples were submitted to McCampbell Analytical in Pittsburg, CA for analysis of PCBs and CAM 17 metals. PCBs as Aroclor-1248 were reported in the two liquid samples at concentrations of 140 micrograms per liter (µg/L)

[expressed as parts per billion (ppb)] and 86 µg/L. It is assumed that an unknown quantity of this liquid may have drained into the floor drain in the southern end of the Mechanical Room and to the sanitary sewer system at the time of release in December 2008. Following receipt of the initial sampling results, a plumber's plug was placed into the inlet to the floor drain and it has remained out of service since that time.

UC Berkeley reported the incident to EBMUD by submitting an Incident Summary (dated November 12, 2008), cover letter and the analytical results via email on March 30, 2009.

Proposed Work Plan for Abandonment of Floor Drains

As part of the USEPA Risk-Based Approval Notice, UC Berkeley is proposing to abandon in place the floor drain in the southern portion of the Mechanical Room and the floor drain in the adjacent room where the building's excess steam vent release line system is located and PCBs have been identified (see Figure 2). Figure 3 provides a typical detail for the floor drains on the Ground Floor of Lewis Hall. Because the floor drain piping is located beneath a 6-in. concrete slab, is inaccessible, and cannot be removed, UC Berkeley will abandon the two floor drain inlets in place using the following procedures:

- Remove the floor drain covers for both inlets and the plumber's plugs that were recently installed by UC Berkeley. Collect surface wipe samples of the accessible inside surfaces of the floor drain piping for the two inlets and submit to a State-certified analytical laboratory for analysis of PCBs by EPA Method 8082.

- Fill the volume of the pipe for each floor drain using either grout (such as a hardening slurry consisting of cement, bentonite, or clay) or high-density polyurethane foam (see Figure 3).

- Coat and seal the grout or high-density polyurethane foam that will be placed in the floor drain inlets with multiple layers of the same epoxy sealant that will be applied as needed to the concrete floors and walls in the Mechanical Room.

UC Berkeley appreciates EBMUD's consideration of our work plan to abandon the two floor drains on the Ground Floor of Lewis Hall. Please contact Kelley Etherington with the UC Berkeley EH&S at (510) 643-7195 by phone or kelley_e@berkeley.edu by e-mail if you have any questions regarding this work plan.

Sincerely,

Chris Christofferson
Assistant Vice-Chancellor
Physical Plant-Campus Services
University of California, Berkeley

Enclosures: Figures 1 – 3

cc: Kelley Etherington
Rebecca Anderson

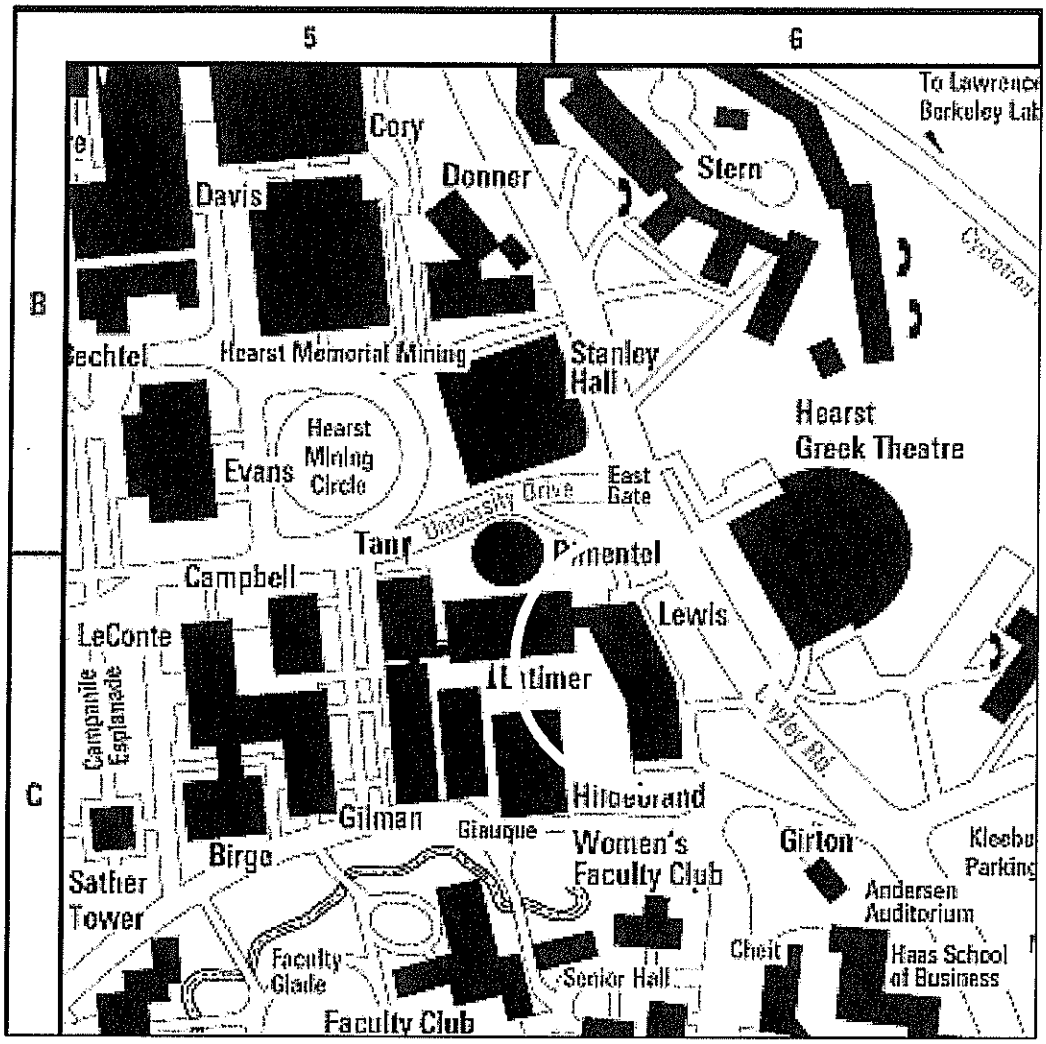


Figure 1. Site Vicinity Map of Lewis Hall on UC Berkeley Central Campus.

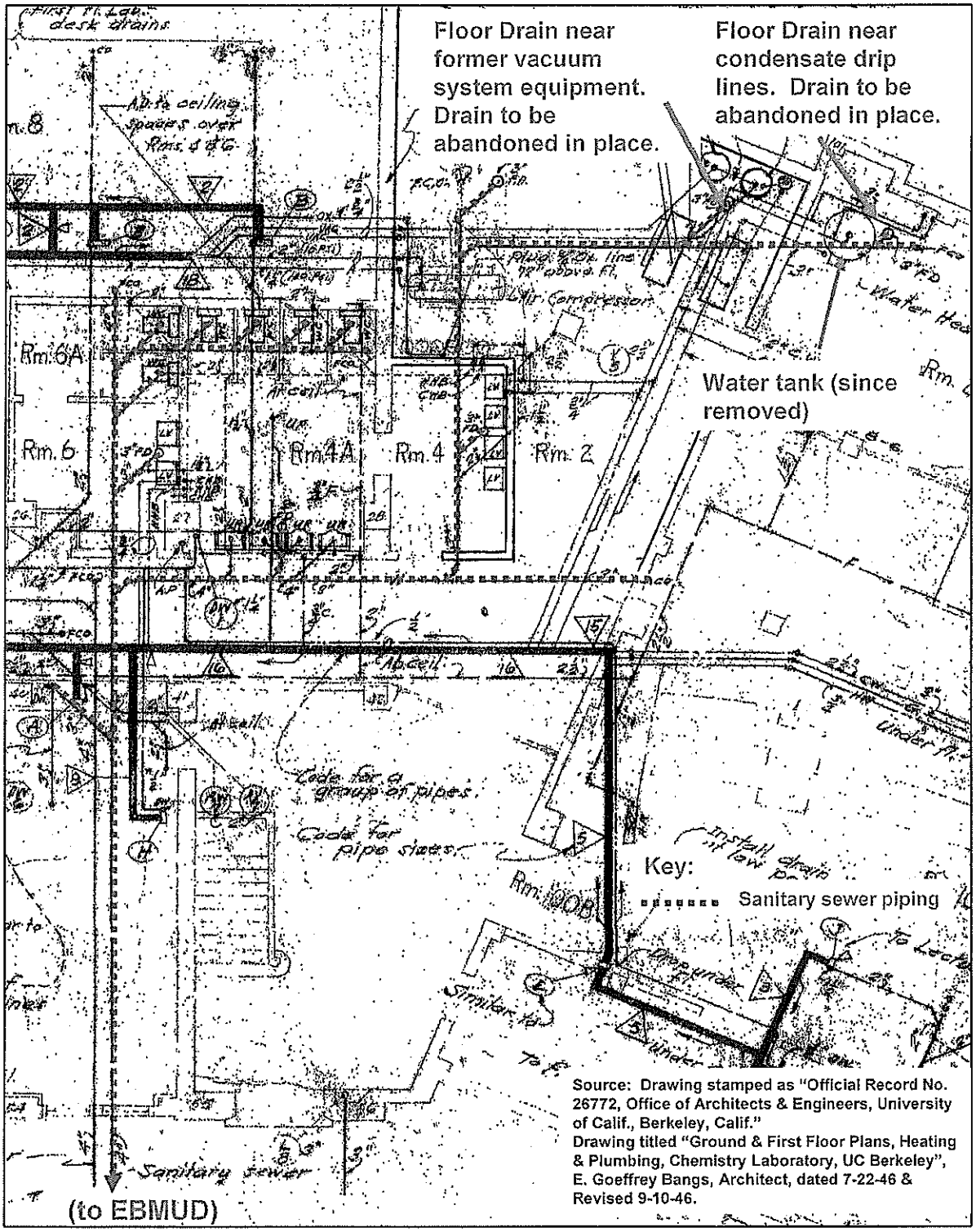
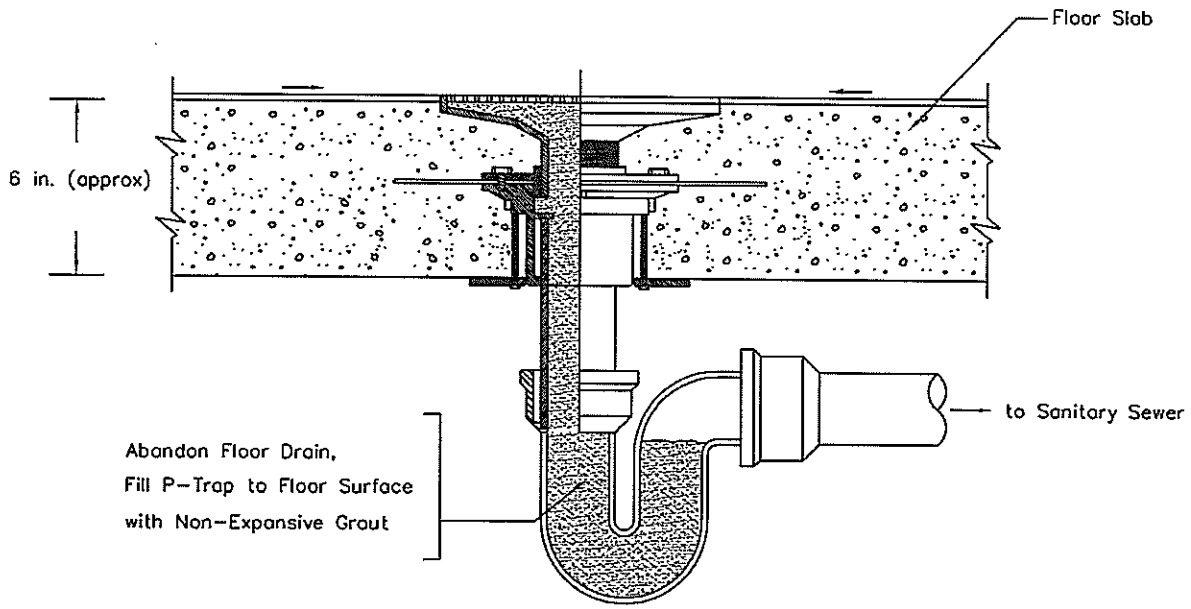


Figure 2. Schematic of sanitary sewer piping beneath the Ground Floor along the southern portion of Lewis Hall.



FLOOR DRAIN DETAIL (Typical)

Not To Scale

4LEAF, INC. | FIGURE 3

Schematic of Floor Drain (Typical) - Mechanical Room

Lewis Hall, UC Berkeley Central Campus

Appendix B

EBMUD Agreement Letter for Abandonment of Floor Drain Inlets

EAST BAY
MUNICIPAL UTILITY DISTRICT

DAVID R. WILLIAMS
DIRECTOR OF WASTEWATER

March 25, 2011

Mr. Chris Christofferson
Regents of the University of California, Berkeley
2000 Carleton Street
Berkeley, CA 94720

Dear Mr. Christofferson:

Re: Lewis Hall Ground Floor Drains

East Bay Municipal Utility District acknowledges receipt of your March 10, 2011 letter regarding the proposed work to seal two floor drains located on the ground floor of Lewis Hall. The District agrees that sealing the floors is an effective means to prevent contaminants entering the sanitary sewer system.

Sincerely,

GAYLE TUPPER
Supervising Wastewater Control Representative

GT:DMM:

W:\NAB\IDS\Permits\Local\Regent of the University of California-Berkeley\Permit\Permit 2008-13\Lewis Hall Basement Floor Drain.doc

cc: Kelley Etherington, UC Berkeley, Office of EH&S, University Hall, 3rd Floor, Berkeley 94720
Greg Haet, UC Berkeley, Office of EH&S, University Hall, 3rd Floor, Berkeley 94720
Gilbert Escobar, UC Berkeley, Physical Plant, 2000 Carleton Street, Berkeley, CA 94720